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Fig. 10.—Square in Poker Work. (Two-thirds size.)

Fig. 11.—Square in Poker Work. (Two-thirds size.)

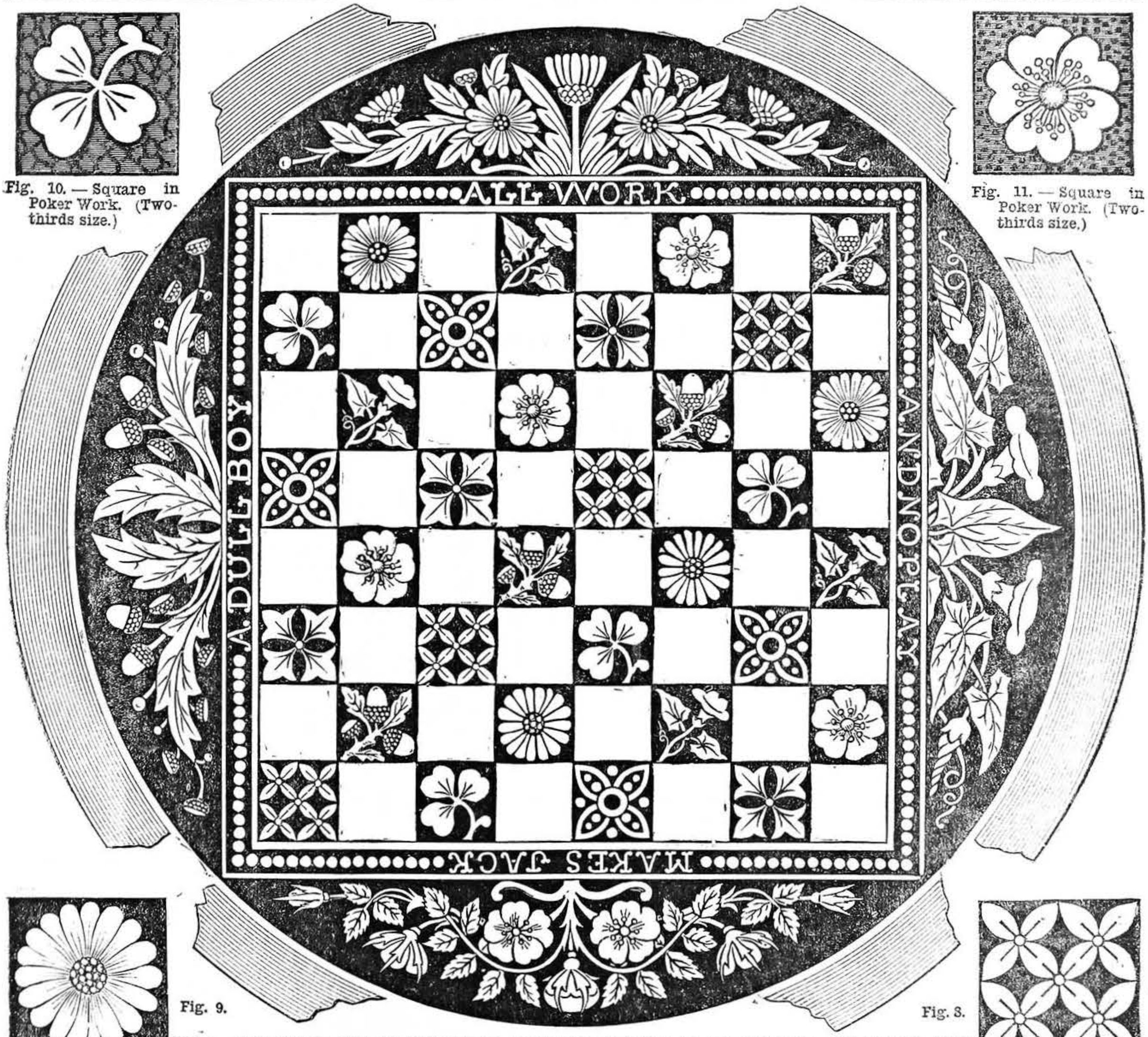

Fig. 9.

Fig. 8.

FIG. 1.—DESIGN FOR CHESS TABLE IN INLAID WORK, CARVING, OR POKER WORK. (ONE-THIRD SIZE.)

Fig. 2.

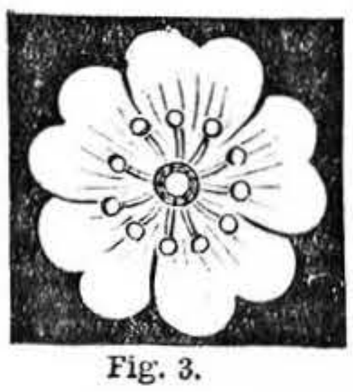

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

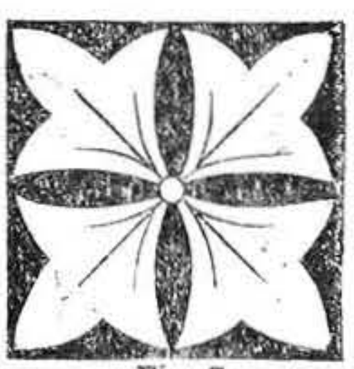

Fig. 7.

Figs. 2-9.—Enlarged Squares. (Two-thirds size.)

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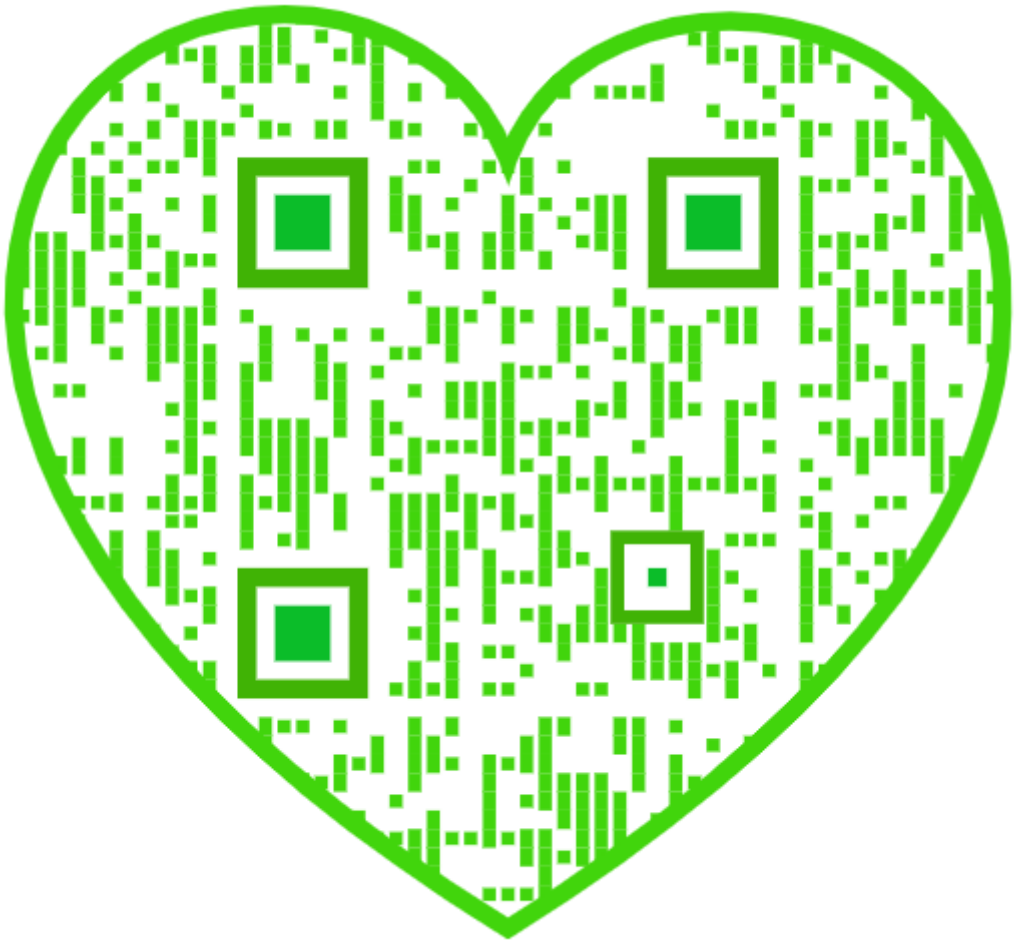

DESIGN FOR A CHESS TABLE.

BY FLORENCE HUDSON.

THIS design may be carried out very effectively either in inlaid work, carving, or painting. The best effect would doubtless be obtained by inlaying, such as ebony and ivory, well-contrasted woods, or stone mosaic, in the style of the Torquay work.

But these methods are costly, and moreover require technical knowledge. Whitewood tables are now procurable at all stores and artist's shops, and are most tempting for decoration, and an excellent effect may be obtained by either of the following methods, without any special knowledge and at little expense.

A close-grained, smooth, white wood should be chosen, and two things must be remembered—*i.e.*, not to lose the sharp contrast of light and shade, and that any ornamentation by relief must be below the plane of the table, as represented by the white squares and pattern, otherwise the chessmen will not stand easily. Also great care must be taken in tracing or drawing the pattern, that the squares are true.

Wood Carving.—Having gone round outside (that is, on the dark side) all the patterns and lines with a small gouge, the dark ground can be cut down roughly, so as to leave the pattern in slight relief, and the veins in the leaves can be finely cut. The dark parts must be stained, taking care not to encroach on the light parts, and the whole subsequently polished.

Poker Work, or burnt-wood engraving, may be substituted very effectively for carving proper. Follow the outlines, and also the veins, with the point. Then the ground may all be dotted closely with the point. This will probably darken the wood sufficiently without staining, but if not, stain and polish as with the carved work.

Imitation Inlaid Work.—The following are very simple but most effective ways of producing the effect of inlaid work :—

Having well sized the white wood, and drawn the design, go over all the outlines firmly with Judson's artist's black, which is really a beautiful dark brown. Then put on a mottled brown ground with the same, diluting it with a little turps. When thoroughly dry, re-size (taking care that the brown does not smudge), and either varnish or French polish, which is by far the most lasting and effective way of finishing. Or ebony and ivory may be imitated by painting all the light parts with perfectly smooth, thick, Chinese white, and the dark with ebony black instead of artist's black. Care must be taken in subsequent sizing and varnishing that the white and black do not mingle. It is as well to size each separately. The effect is excellent if carefully done; or if colour is desired, the colours chosen can be mixed with Chinese white and glazed with pure colour after. When all put on, outline everything with a fine black line (a little gold-size or veloutine mixed with lamp-black to prevent its running), and then size and varnish, or, better, French polish. The fine black line gives quite an inlaid effect.

This design was carried out originally with 1½ in. squares, on a table top of about 19 in. diameter.

Table tops vary so much, that the safest way is to find the largest possible square to be had out of the circle; and then to arrange the eight squares and lettering to such a scale as will be well within that limit. In other words, when the whole design is drawn, there should be room left for a bevelled edge, or narrow white border, round the edge of the table.

In whatever way the art-worker may elect to carry out the design, the effect, provided always that the execution be good, cannot fail to be satisfactory. But I shall be understood when I add that it goes well-nigh without saying that everything depends on the way in which the work, whether it be inlaying, carving, or painting, is done.

PRACTICAL PAPERS FOR SMITHS.

BY J. H.

CASE HARDENING — CASE HARDENING AT THE FORGE — BOX HARDENING — FORGINGS FOR MODEL WORK—DIFFERENCES BETWEEN MODEL AND GENERAL WORK—ANVIL—FILE—LEAVING PARTS SOLID—STEEL BETTER THAN WROUGHT IRON FOR MODEL WORK—DIE FORGING—FORMATION OF DIES—QUANTITY OF MATERIAL IMPORTANT.

IN the first paper of this series I mentioned several subjects on which I proposed to treat. Space is narrowing up, however, and I find that I must perforce omit two or three of these, and discuss the remainder as briefly as possible in this and in the succeeding and final paper. In this I shall touch on (1) case hardening; (2) model work; and (3) die forging.

(1) *Case Hardening.*—Case hardening is a method commonly used for rendering the surface of wrought-iron work as hard as tempered steel. The advantages of its employment are that the toughness of the wrought iron is combined with durability of the wearing surfaces as great as that of steel; and that the first cost of the forgings, and of the cost of their being tooled and finished into shape, is less than the cost of steel forgings. Case hardening is adopted in link-reversing gear for engines, for the eyes and working faces of various levers, for pins or pivots, and so forth. It is performed as follows :—

There are two methods adopted in case hardening—hardening at the forge, and hardening in pots.

Case Hardening at the Forge.—To case harden at the forge, get a quantity of yellow prussiate of potash powdered very fine in an iron tray. Heat the work in the clear fire to a red heat. Take up the prussiate powder in a spoon, and strew it thickly over the surface of the forging. If practicable, roll the forging also in the tray of potash. Time must be given to allow the powder to fuse and run freely over the surface, and then the forging is quenched in water to harden it.

If the forging is so light that it loses its heat too quickly, and before the potash has had time to penetrate, then it must be returned to the fire and heated up to the red heat again before plunging it in water.

Box Hardening.—But this method is only suitable for small work, and not for articles of large and irregular form. For these, box hardening is resorted to. Boxes of various kinds are employed. For the heaviest work, cast-iron boxes of circular form with cast-iron covers are used. They are of sizes suitable for the work in hand, ranging, say, from about a foot to two feet or two feet six inches in diameter for engineers' work. For small work, tubes of wrought iron or old pulley bosses are used. The process of hardening is as follows :—The bottom of the box is covered with a thick layer of the hardening material. This consists essentially of such nitrogenous and carbonaceous substances as bone dust, leather clippings, hoofs, salt, and charcoal powder. The forgings are made to alternate with the hardening material in the box. If the forgings are heavy, care must be taken to give them good support among the material, so that they shall not become distorted by their own weight while at a red heat. When the box is filled with alternate layers of work and of material, the cover is put on, and luted with fire clay. It is essential that air be thus completely excluded from the box. Then it is placed in a fire, or, preferably, in a reverberatory furnace, for periods ranging from, say, ten to thirty-six hours. The time during which the box is exposed to the heat of the furnace mainly regulates the depth to which the case hardening will enter. The result, however, depends also partly upon the chemical activity of the hardening agents.

This is assisted by the addition of the salt just now mentioned. Finally, the forgings are turned out into cold water, and are thus hardened. The depth to which the case hardening penetrates varies with the conditions named above. It will range from $\frac{1}{64}$ in. to nearly $\frac{1}{8}$ in. But in the same forgings its depths will not be quite uniform. For light articles, of course, a mere film of surface hardening is enough; for heavy work, the steely casing should penetrate to the maximum amount, or nearly $\frac{1}{8}$ in. There is this to be said: that since hardening distorts the work, the minimum amount of penetration that is consistent with the purpose for which the forgings are required should be imparted to them—$\frac{1}{16}$ in., or a bare $\frac{1}{16}$ in., may be taken as a good average. In almost all instances the process distorts the forgings somewhat, sometimes more, sometimes less; and the fitter has to correct outlines, not with a file, which of course will not touch case-hardened work, but with an emery buff, or emery paper.

(2) *Forgings for Model Work.*—Forgings for model work are necessarily expensive, for two reasons. In the first place, in order to produce shapely forgings so nearly like the ultimate finished work that only moderate and uniform amounts for machining are afforded, much time must be spent upon them. In the second place, very few smiths care to undertake such work, because it pays them better to do the ordinary work of the forge, and also because a man must be an exceptionally neat workman to turn these out as perfect as they ought to be made. Yet it is work that practised amateurs, with more time than cash at their disposal, can succeed pretty well with, because there is less of high skill than patience wanted, and there are scarcely any of the really difficult operations of forging involved. There are few special tools required, most of the work being done with hammers and files. The cost of material is small, and the principal appliances are a small anvil and a vice.

Differences between Model and General Work.—Speaking generally, we may say that there is less of welding and more of drawing down done in forgings for model work than in those of heavy type. The difference in the dimensions of bossed-up ends or forked ends and their shanks or rods is so small relatively, that it is much easier to reduce the latter with the hammer than to weld the former on If, however, the bosses are of considerable thickness, or the forks large, then it is better to weld them on. There is no difficulty in welding small work, provided no time is lost in hammering the parts together immediately on removal from the fire, which can be done upon a small anvil or a block of iron laid upon the side of the forge.

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Anvil.—For very light work, one of the small combined anvils and vices will be found serviceable. The work can then be transferred rapidly from one to another as occasion requires, without loss of time. One advantage of a small anvil is that the beak is very useful for turning curves, and to form a suitable bedding when fullering down curved necks and shoulders. For these the ordinary fullering tools are too large. The cross panes of the hammers are useful for this operation. With hammers of different sizes, radii of various curvatures can be formed. Neither are flatters used, but all the battering and smoothing that is done is effected with the hand hammer.

File.—Owing to the unsuitability of smiths' ordinary finishing tools for purposes of model work, the file has to be used much more largely in this class of work than in ordinary forgings. When the forgings are cooling down to a black heat, a good deal of material can be removed with little effort, and some kind of finish imparted, that it would be difficult to impart by the hammer alone.

Leaving Parts Solid.—Again, in small forged work, many parts are left solid that would be punched or fullered, or cut out in large work. The holes in bosses would seldom be punched, but left to be wholly drilled. The forked ends of eccentric rods are left to be slotted or filed out.

Steel better than Wrought Iron for Model Work.—When wrought iron is used for model forgings, the same regard must be had to the direction of the grain as in larger forgings. But in all respects steel is preferable as a material for model work to wrought iron. There is, practically, no grain. It does not open out and prove spilly, like the inferior kinds of wrought iron. It is hard, rigid, and strong, an important consideration when light and slender work is in question, and takes a better polish, and is more durable. For these reasons I should always give the preference to steel over iron for light model forgings.

(3) *Die Forging.*—Die forging, or stamping, is adopted in all modern firms doing repetition work. There are numerous parts in nearly all branches of smiths' work that are required precisely alike, and an enormous saving—often as much as 300 or 400 per cent.—is effected over the hand methods by stamping such work, wholly or partially, in dies. Such parts as flat links for pitch chain, flanges for steam and exhaust pipes, some portions of valve gear, ornamental bosses, railing heads, pins, small levers, and a host of similar articles more or less intricate can be readily stamped with proper appliances. Moreover, another great advantage of such stamped work is that it takes the precise form of the die, and its accuracy is such that the very minimum amount for filing, turning, machining, or polishing can be allowed, and that in a perfectly and uniformly precise amount.

Formation of Dies.—The dies are usually made either of cast iron or of steel, the larger dies in the former, the smaller in the latter. In the former case, the required impressions are cast out, and afterwards cleaned and smoothed a little with the file; in the latter case, they have to be cut out with drills, chisels, and files. In either case, sufficient metal must be put into the die to enable it to withstand without fracture the concussion of the blows to which it is subjected. Cast dies are, further, frequently bonded with a wrought-iron ring in order to prevent their bursting under the stress of concussion. For this kind of work the sledge is no use. In little country shops, unprovided with power, the Oliver can be used. But generally the drop hammer, steam hammer, or hydraulic press are used for work of this character; and the heavier and more powerful within reasonable limits they are, the better.

The general mode of working off die forgings is as follows:—The formation of the dies themselves must needs vary with the shapes of the forgings. In the plainest work a single bottom die will often suffice. But if the top of a forging is not plain, then the die must be divided, the upper portion being cut to the requisite outline. The top portion must also be attached to the lower in such a way that it will take its proper position in relation to the lower instantly, without any adjustment. This is usually effected by means of iron dowels, two or three dowels being driven tightly into the lower portion of the die, and standing upwards to fit into corresponding holes drilled in the top portion of the die. The dowels are well tapered, and their ends rounded off to give every facility for entering quickly into the holes in the top portion of the die. Sometimes the bottom dies are furnished with long handles for their manipulation. But as frequently, they are lifted about with the hoop tongs, and the top dies only are furnished with handles. When holes have to be punched in the forgings, corresponding holes are usually drilled in top and bottom dies. The top holes are then parallel, and of the same size as the punch which is inserted in them; but the bottom ones are only of the same size where the lower face of the forging lies, being tapered thence downwards to allow the punched discs to fall down freely.

In many cases two sets of dies are requisite to produce an article. One set will form the sides, and another set the top and bottom. Into the details of these and kindred matters I cannot enter, nor into the relative cost of die *versus* hand forging. Of course, dies are expensive, and however desirable from the point of view of accuracy the use of dies may be, there must always, from a commercial point of view, be a balance struck between the cost of a given quantity of forgings done by hand or by means of dies. As a general rule, there must be at least several dozens of an article required to pay the cost of dies.

Quantity of Material Important.—In stamped work, the amount of material required for any given forging must be gauged with accuracy. If there is a little excess of metal, there will be thick fins spreading over the edges, which will not only have to be laboriously cut or ground off, but will prevent the dies from meeting, and so cause the forgings to be thicker than they ought to be. If, on the other hand, the metal is short, then the forgings will not come up keen and clean, but will have edges more or less rounding and inaccurate. After two or three tentative attempts have been made, the amount of metal necessary for any given forging should be estimated accurately.

Time is passing on, and the date that brings us to the conclusion and completion of the third volume of WORK is fast approaching. I am warned, therefore, that this series of papers on the work of the forge and smithy must be brought to a close also, as I said at the commencement of this paper. So the space that yet remains at my disposal shall be devoted appropriately and, I trust, usefully, to the arrangements of the smithy.

SCARF ORNAMENTS.

BY H. S. GOLDSMITH.

Scarf Pins.

THE methods that jewellers employ to attach ornaments to the necktie or cravat arrange themselves in three classes, two of which are in ordinary use, while the third is nearly forgotten. One of the two is the subject of this paper, the other is the scarf ring. As these latter are still worn to a considerable extent, they deserve a paper to themselves; but for the third—*i.e.*, scarf brooches—a paragraph here will suffice.

Scarf Brooches are mostly of the "comet" pattern shown in Fig. 1, and surely it is about time that the beautiful designs and exquisite workmanship often found in these old-fashioned pieces of work were reproduced, or else that the ideas on which our great-grandfathers based their style of scarf—or rather, shirt-frill—ornaments were once more submitted to the public. This will doubtless depend on the fickle decrees of fashion, and if plain cross-over ties should ever be "the thing," then we may expect and hope to see a revival of the manufacture of this class of ornament.

The opportunity for varied patterns that the elongated form of a comet brooch gives, causes one to wonder why they have not reappeared long before this, if only as a contrast to the insignificant, puny, round beads and minute crescents and horseshoes that have been made by the hundred for the last year or two.

In these scarf brooches, although variety of form is one point, still there is another which we might bear in mind nowadays, and that is the attempt at producing a "jewel." This was defined for us by Carlo Guiliam—the modern Cellini, as he is called—in a lecture given at the Society of Arts on the "Art of the Jeweller." He says: "The object of a jeweller will be to produce the largest amount of beauty in the most limited space possible under the circumstances. A piece of goldsmith's work need not necessarily be expensive; it is the style, the design, the form that will give that grace and refinement which will give joy and pleasure to look at it. The very word itself is derived from the Italian word *giojello*, meaning joy, pleasure to the eye."

Such a paragraph as that applies to our trade in every branch, but with regard to scarf brooches especially, one finds that, be they even plain rounds or ovals, even then the maker has not only done the mechanical part excellently, but by the employment of various well-chosen colours both in stones and gold, as well as in contrasting plain and chased surfaces, that he has produced a real "jewel." The stones in these scarf brooches are not restricted to diamonds alone, but rubies, emeralds, and pearls are very often met with.

The one sketched here (Fig. 1) is a very usual pattern: it is intermediate between the collet with a simple bar and the much more elaborate ones that are to be found in the hands of connoisseurs.

Pin-stems and the Principles that govern their form.—Pin-stems and the parts that attach them to the pin-head is, then, the principal subject of this paper. But before we enter into details, let us spend a minute or two in thinking over the purposes for which they are made.

The first thing is, doubtless, to give security to the ornament. Now, the consideration of that leads us naturally to the means we ought to adopt to obtain the utmost power

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of holding combined with the equally important—and opposite—quality of easy insertion. In different places different methods are used. Length only is thought sufficient by the French people, for their pin-stems average nearly 3 in. in length, and they are but plain pieces of hard gold wire, nicely pointed. We in England, in trying to "make assurance doubly sure," generally make a groove in the stem, like Fig. 3, D; or else use some of the methods to be mentioned later on, such as the addition of spikes or nuts, etc.

In old work, another sort of addition is introduced for the purpose of obtaining greater security, and that is illustrated in Fig. 5. It is, as you see, another and generally smaller pin, connected by means of a fine chain. The custom of chaining scarf pins together is one that has fallen into disuse, notwithstanding that the fine chain and small pin-head add greatly to the appearance of the chief ornament, leading up to and pointing out the larger one rather than detracting from it; just, in fact, as the frame of a picture improves the appearance of the painting.

Sometimes we find that three pins are attached to one another, each one of importance in itself, and, as one would naturally expect, the chain is occasionally made more of an ornament still by being set with stones, or else by having pearls strung along it at intervals.

This seems beyond our immediate purpose, which is the consideration of obtaining security for the ornament as now worn; so, to proceed with the technical details. One has but to call attention to Fig. 12 (A, B, C, D, E, F, G); these are, of course, the most secure of all, for by the addition of a nut or a pin, *after* the scarf pin is adjusted in the scarf, it becomes impossible for it either to ride up or drop out, or even be snatched out by any of the light-fingered fraternity.

Details of Manufacture.—We have glanced at the main purpose of pin-stems, now to consider the best way to carry that purpose out.

We must, in the first place, have the pin-stem pointed, for it has to be inserted in a silk scarf, and it must be strong enough to bear forcing in and out of and through several thicknesses of material. On the other hand, it should not be made thicker than is absolutely necessary, else it would make a large hole, and possibly spoil the scarf.

There is yet another consideration to bear in mind, and that is with reference to the pin-head. For the purpose of clearly indicating the last reason, we will suppose (as an extreme case) that a bead is to form the pin-head: one made, say, of delicate wire-work, and quite hollow. Now, if a piece of filigree work such as this were attached to a thick or clumsily-made stem, would not the result be that the bead would be squeezed up by the finger long before the stem could be forced in and through the hard scarves that are now worn?

The guiding principle of making stems is proper proportion—that is, of greater or less thickness, according to the strength or fragility of the head of the pin, or the use it is to be put to. This proportion, *i.e.*, suitability, is one of the points that a good workman would be sure to have in his mind.

In extreme cases it may be advisable to use a steel needle in place of a gold stem, for be the head ever so weak, it has got to act as the means to force the stem in, and we can do nothing else but use it.

Now to make an attempt at describing, as thoroughly as may be, the steps in the manufacture of a simple plain pin-stem, and then from this—the simplest type—we can show, step by step, the alterations from that which are in common use. It is to be hoped that it will be done in such a manner that an apprentice will be able to judge for himself the different advantages, defects, or improvements that such alterations bring in their train.

French Pin-stems.—The simplest stem of all is that illustrated in Fig. 2; it is that used in all French work. It is a quite plain piece of pointed wire, made in 18 ct. gold (alloyed all copper), which has necessarily to be drawn down very hard, to get rid of the natural pliability of that quality. This means, as you know, that for the last twenty or more holes in the draw-plate which it has been through it should not have been annealed. Even that is probably too little, and it would have been better to have twisted it and hammered it, and *not* annealed it at all. Experience will only teach that, so we will take it for granted that your wire is to the proper size, straight and hard; the length we have spoken of as being about 3 in. for smooth stems, the thickness size, 17 B.W.G., or 19 Shakespeare flat gauge.

Of the way it is to be attached to the head, more is written later on, so we now have but to consider the point you have to put to it. It should be like Figs. 2 and 3—that is, neither weak or thin, nor blunt and ugly, like Fig. 4, *b*. Pin-stems are pointed this way doubtless as a result of experience, for we find the same shape of point almost exactly in the ordinary pins sold by the drapers. If you will compare these with needles, you will see how the greater hardness, etc., of the metal, steel, permits of a much finer point to the latter.

In the metals—gold and German silver—we cannot obtain such a special hardness, therefore do not make your pin-stems with points like a needle, but condescend to follow the shape given to the humble ordinary pin, which is made of a metal resembling those we use.

This calls to mind that we have of late years had to make up small gold pins, with pearls for heads, to be used to fasten dress ties to the shirt collar. For these also no better model can be found than "short whites" of good quality. Plain stems are occasionally used for the light pins that ladies have to fasten their lace with; the length and strength of stem being made proportionate, of course, to the use they are to be put to, and to the size of the ornament they carry. They will, therefore, be several sizes thinner than the usual stem.

Twisted Stems.—From a length of 3 in. we drop to an average length of 2½ in. when the stem is other than plain, such as the general one with a twist, used here in England.

There are two ways to make this form of stem with a hollow, or twist, or groove in it; both ways have their advocates, or at least their users. One way is by filing the groove, the other by hammering and twisting the stem.

The first is thought to be somewhat objectionable, for this reason: that the bottom of the groove is very likely to be not round, but sharp—a continuous nick, as it were. Now, a sharp nick is always the place of greatest weakness, which you can see for yourself if you notice how small a nick, comparatively, an engineer will put in a rod of steel at the place where he wishes to break it.

As we do not want our stems to be always breaking, the second method is preferred by the writer, for he holds that the twisting of the grain of the wire tends towards retaining a good part of the strength which is liable to be lost by having these hollows in a stem.

The steps in making a pin-stem after the second process are drawing the gold wire (9-ct., usually) to a proportionate size—say, 17 B.W.G. size, or the Shakespeare flat gauge, size 19; then to cut it into lengths of about 2½ in., straightening it in the draw-plate before cutting it, of course.

We now have a piece of wire 2½ in. long, straight and hard (Fig. 3, A): this has now to be annealed in the centre, where the twist comes, and nowhere else; then flatten it out with the hammer, like Fig. 3, B, and 3 B′, not with an unequal thickness like Fig. 4, A.

Again anneal it, and proceed to twist it until it comes like Fig. 3, C. This will be done with a couple of hand vices, or in the same way as a brooch tongue is done (see p. 648, Vol. I., of WORK, Fig. 4).

If there is any soldering to be done, it will be the best time to do it now, before the stem is hardened. It may have to be soldered to the head, or a collar may be required; if it is, then let it be a small one—not anything like the great ugly thing on Fig. 4, B.

Now to harden it and finish it. It is soft all over now, except at the point, which you have not been told to anneal, and a good deal of trouble will be saved if you have not annealed it, but have kept it hard. If through inattention or carelessness you have annealed it, then proceed to hammer it first one way, then the other; but do not get it "double"—*i.e.*, split—if you can help it. A pin-stem with a double point ought to be replaced with another one, for soldering the end up means farewell to nearly all hopes of getting a firm, strong point.

If all is right, then hold the stem on a sparrow-hank, small anvil, or smooth iron, and proceed to reduce it to the same diameter all along.

The blows of the hammer are to be many in number, and not heavy, for we have to obtain a gradual and thorough hardening, and to that end the stem must be rotated all the time by the finger and thumb, so that the blows of the hammer will strike successive parts; thus the round section of the wire will be brought back again. This also straightens the stem, so we can proceed to file it up, first roughing the points down, then with a smooth file going over all of it from collar to point; the result should be something like Fig. 3, D. The point, you will notice, is of the same shape as the French one.

Badly-made Stem.—As contrasts help to indicate the point of one's argument, Fig. 4, B, is given to be compared in all particulars with Fig. 3. Here follows the chief fault it possesses. It is hammered too thin in the centre of the twist, the wire itself is too thick, the twist is too long and too near the point, and is of course irregular, and finishes off with a kind of gash: then the point is too blunt. That is a too general fault, and yet it could be so easily altered in this and all other cases; but unfortunately it is not. The collar at the top is too large; not that this tends to weakness, but because it is out of proportion to the work it has to do—viz., to act as a stop to tighten the screw against.

Polishing.—There are one or two other things that might be said, but we will get

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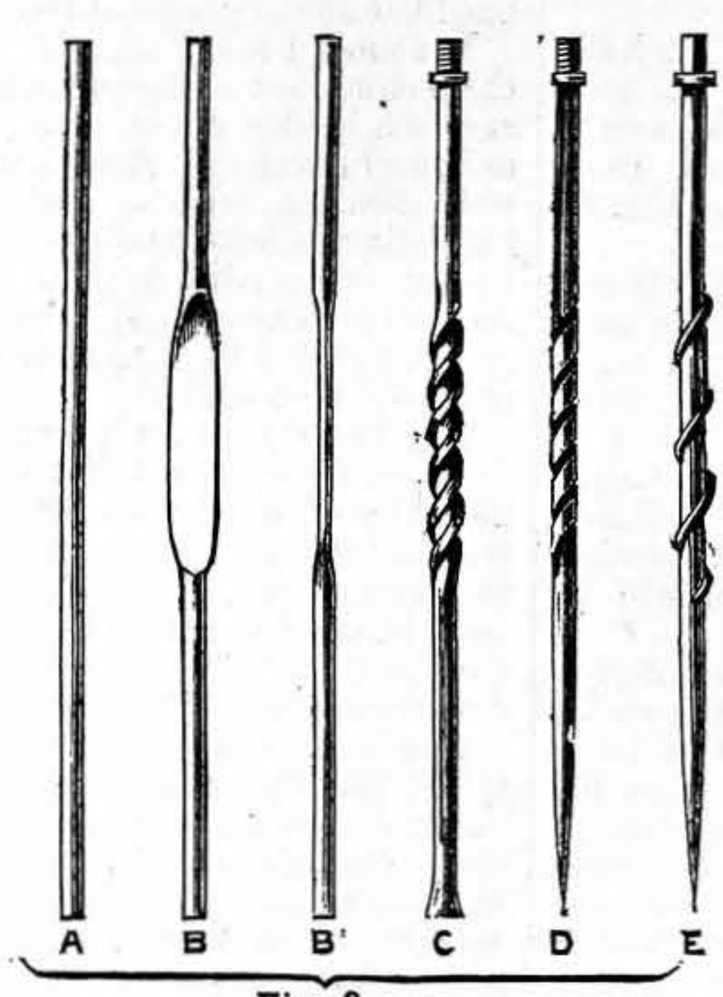
the stem finished off; it only wants polishing. Take a bundle of threads, and charge one single one with crocus and oil; coil it round in the groove and rub away from one end to another; after that, use water of Ayr stone and buffs; don't take it to the lathe and polish off all the corners with a wheel brush: the edge of the groove should be sharp and square, and for a reason apart from the look of the thing. It is a small matter which is generally overlooked, for we know that the object of the twist is to keep the pin steady in the scarf; that being so, no individual will dispute that a hollow with rounding edges is much less likely to catch the silk than one with their square corners.

Do we not twist our stems in the wrong direction, and, in so doing, throw away a considerable amount of holding power? If we twisted our stems as a right-handed screw, and screwed them into the scarf, we should then get plenty of hold: as you can try for yourself when you come across or make a stem with that twist as suggested. I believe the original maker of this kind of pin-stem intended them to be screwed in; but of course people do the things the easiest way, and as a consequence we find that not one in one hundred has its thread to the right. I have written before this about the left-hand screws

Fig. 1.

Fig. 2



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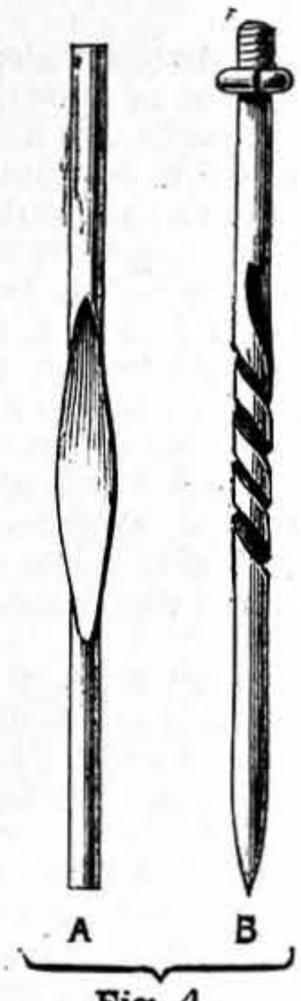

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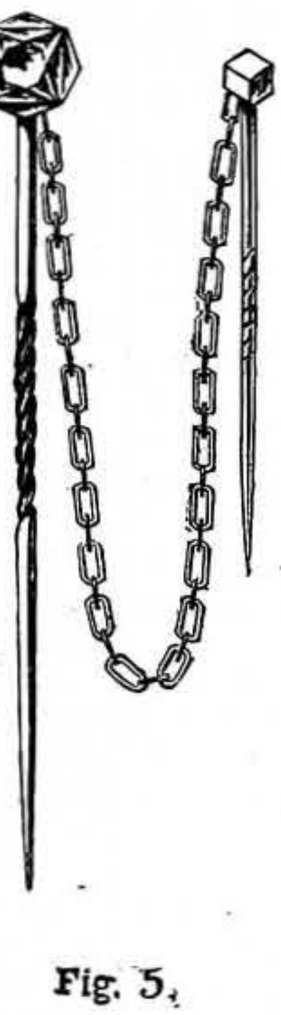

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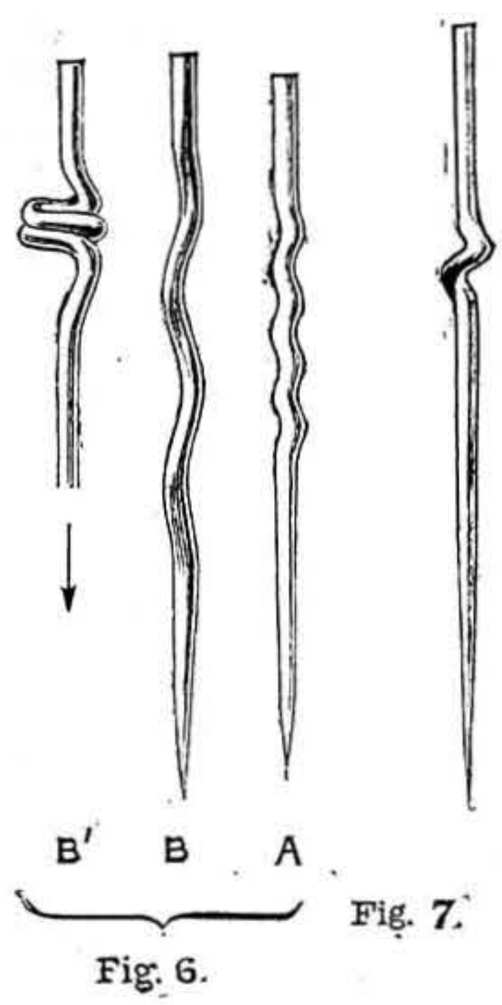
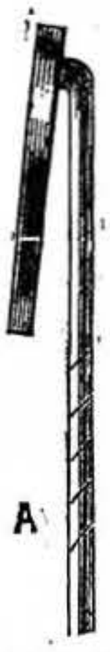
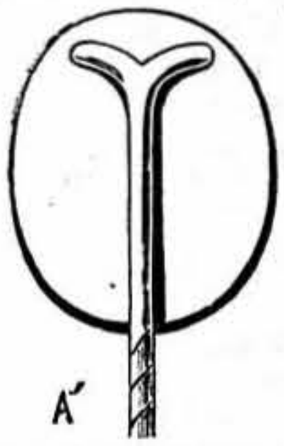
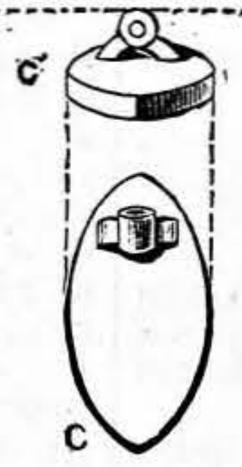


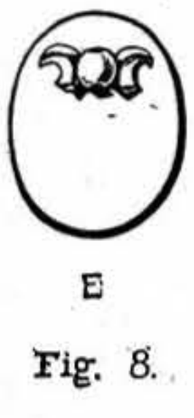
Fig. 6.

Fig. 7.









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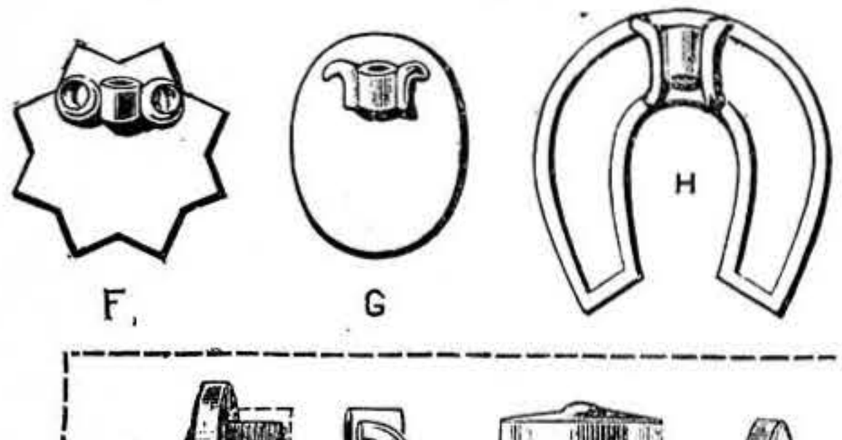

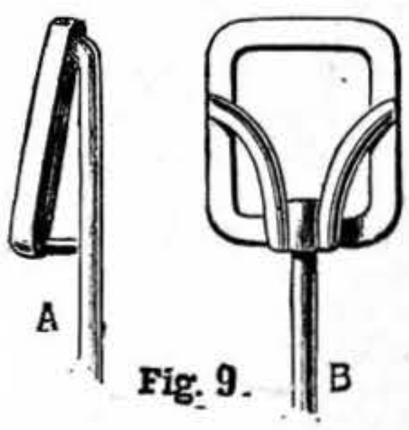

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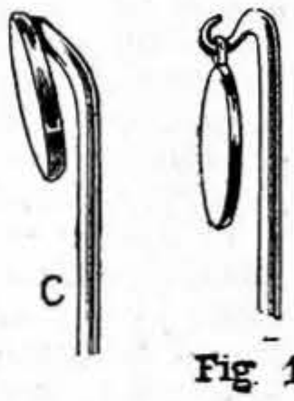

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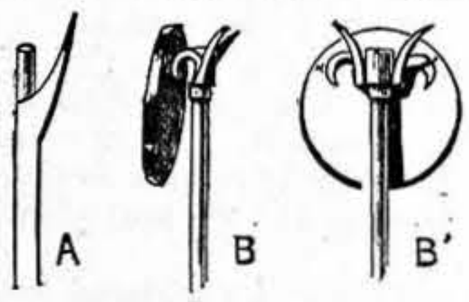

Fig. 11.

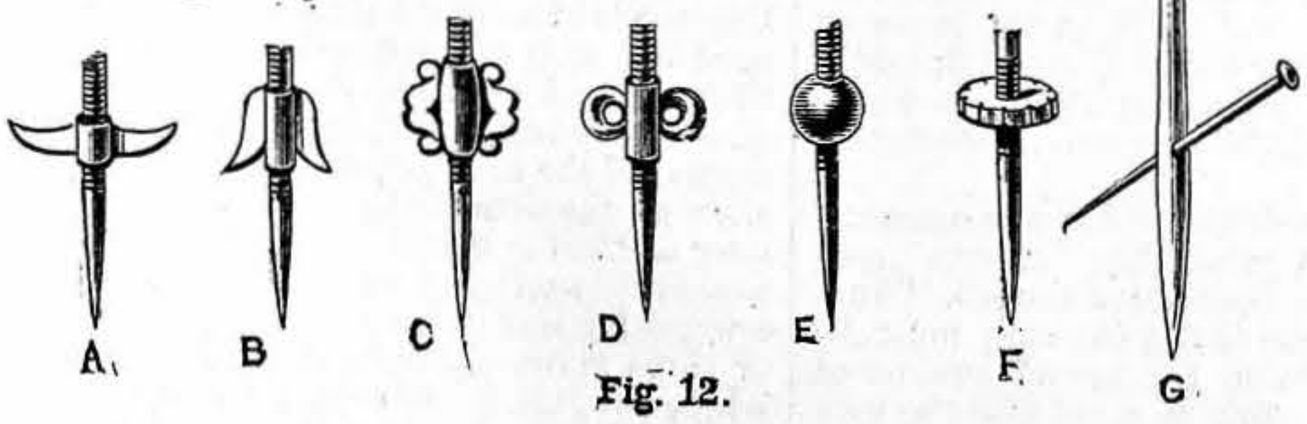

Fig. 12.

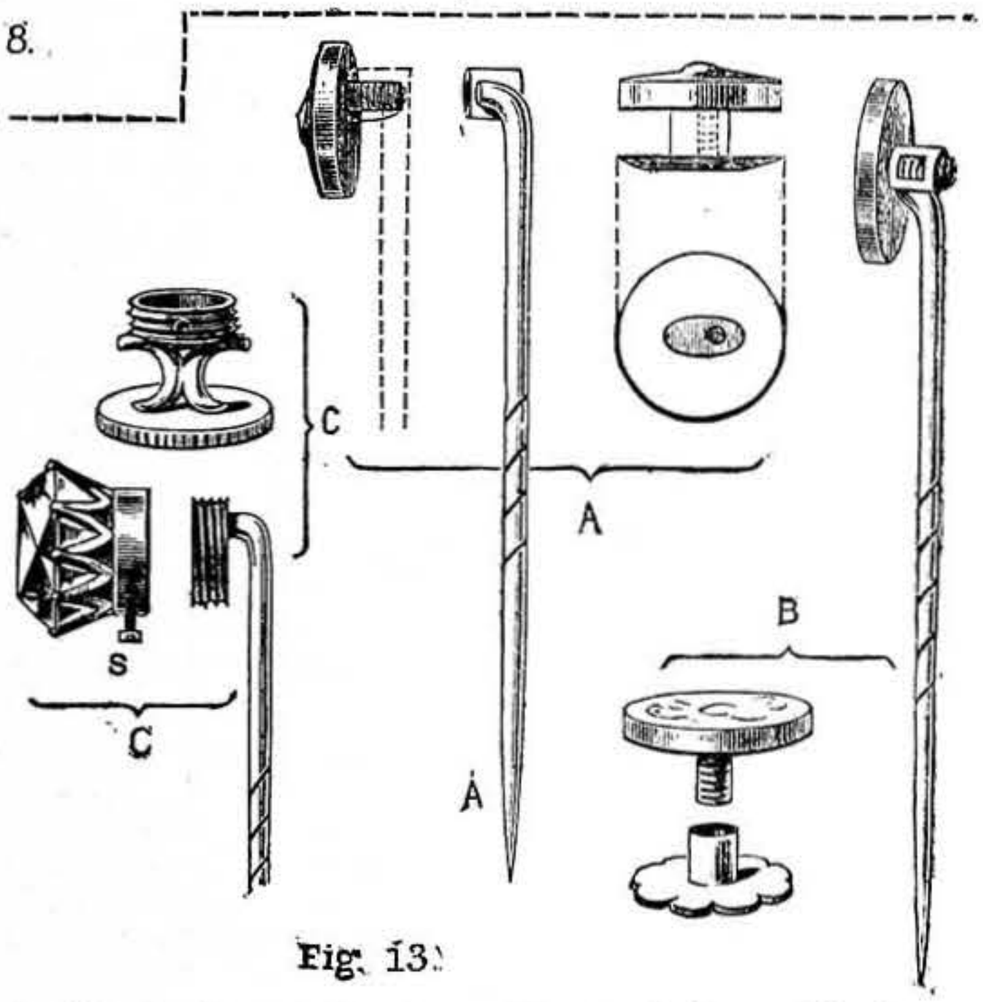

Fig. 13.

Fig. 1.—Comet Brooch, an Old Style of Ornament for Gentleman's Shirt Frill or Cravat. Fig. 2.—French Pin-stem. Fig. 3.—Ordinary Pin-stem—A, Plain Wire before commencing the Twist; B, the same after Hammering; B', the same after Hammering to show Thickness; C, Appearance after being twisted, and with the Collar soldered on; D, Finished Stem; E, Stem with raised Thread. Fig. 4.—A, Wrong way of forging the Stem for twist; B, Shows A when twisted and hammered with bad Style of Point and clumsy appearance generally. Fig. 5.—Square Wire Pins connected by Chain for security. Fig. 6.—A, Zigzag Stem for Lace Pins; B, Spiral Stem for Lace Pins; B', Mode of commencing Spiral Stem. Fig. 7.—Perks and Sons' Screw Stem. Fig. 8.—A, To show the amount of Space to be allowed between Pin-head and Stem; A', Back View of same; B, a more Ornamental Form of A, where Stem is soldered direct to the Pin-head; C, D, Back View of a Stirrup or Socket to screw Pin-stem in; C', D', Side View of same; E, F, G, H, Various Forms of Sockets. Fig. 9.—A, B, C, Bad Forms of fitting Stems to Pin-heads. Fig. 10.—Shepherd's Crook Pin-stem for Swinging Ornaments. Fig. 11.—A, Pin-stem with Spike, to prevent Pin riding up in the Scarf; B and B', Side and Back View of similar arrangement, but with two Spikes on the Pin-head itself. Fig. 12.—A, B, C, D, Forms of Butterfly Nuts; E, Bead Form of Nut; F, Disc Form of Nut; G, Stem pierced for passage of Pin. Fig. 13.—A, Improved Arrangement for Interchangeable Pin and Stud, with Screw soldered above the Centre; B, Pin and Stud as usually made; C, Another Method, where a small Screw (S) can be made to go through the Male Screw on either Pin or Stud to prevent the Setting coming unfastened.

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in Indian ear-rings, which doubtless arises from the same cause—viz., that to produce a screw to advance by turning it to the right, it is necessary to turn the thread in the opposite direction. In place of the groove, a thin wire is sometimes coiled round and soldered, like Fig. 3, E; but this is a formation that is not much used.

Other Kinds of Pin-stems.—It is time that we got along with a description of other stems, presuming that the reader will fit the details already given on to those that follow.

Old English.—Fig. 5 is made from simple square wire, twisted. If the wire be polished before twisting, the result will be better than if it were done afterwards. You may use the hammers to this twisted stem if you want to spoil it; not otherwise. As you see by the diagram, it is this pattern we find in old work.

Lace Pin-stems (Fig. 6, A).—The crinkled one is an approved form for lace pins, where a sharp-edged groove might cause damage. These were formerly used for gentlemen's scarves as well.

A slightly varied form (Fig. 6, B) to this is simply made by twisting the middle of the stem wire round a small mandrel; then after removing the mandrel the wire is pulled out again, until some slightly waving form only is left.

Corkscrew Stem.—Fig. 7 is intended to make its way into the scarf corkscrew fashion. I have for the last few months looked in vain for an older pattern of this in shop windows. If anyone should have to make one with several turns, the easiest way I know is to take a large carpenter's screw, and coil the wire in between the threads; this will give regularity of spiral, and do away with nearly all the plier work—which is, as we know, the thing to be avoided in all wire-work. Fig. 7 has lately been introduced by Messrs. Perks & Sons, of Birmingham, and it undoubtedly deserves a fair trial.

Screw and other Sockets for the Pin-stem.—So much, then, for pin-stems; now for the means of attaching the stem to the ornament. It seems that there are three courses open to us. Have I not met that phrase before? The first and simplest is by soldering it direct on to the pin-head, as the French do, for the greater part; secondly, by making a female or socket mount on the pin-head, and in this to screw the stem; thirdly, instead of screwing the stem in, we can pewter-solder it into the socket.

Are there any rules or principles to bear in mind with regard to the way any or all of these are to be attached? Yes; for in the first place we have to show the ornament, whatever it is, to the best advantage. To do that, it should look well out to the front, and just a little upwards. It should remain steady in that—the best—position, neither leaning first to one side, then to the other, as the pins made from the convertible pins and studs do too frequently.

Two things are to be obtained, then: first, to show the ornament; secondly, to keep it steady. The way they are managed is shown in Fig. 8, A, where the front of the pin-head makes a good average angle with the stem; and for the second, you will notice that the space between them is about sufficient to let the scarf pass easily, and no more.

The scarf *must* be allowed to travel unimpeded as near to the top as possible—just like Fig. 8, A, in fact. It should never be stopped by either a peg like Fig. 9, A, or by having the "stirrup" as low down as Fig. 9, E, nor should the pin-head be tilted like Fig. 9, C. These three were sketched from pins I have had through my hands within a month of writing this, so it is evident that some people don't know or don't think about this.

The space left between stem and pin-head should in all cases be as shown in the side view of Fig. 8, A; perhaps it will be clearer if Fig. 8, A, and Fig. 9, C, are contrasted. Does it need any words to point out that Fig. 8, A, is right and Fig. 9, C, is wrong?

Our model for position and space between the head and stem is Fig. 8, A; something allied to that we are to obtain, be it plain soldered stem, forked stem, or socket (stirrup) and stem that we are using. If that is understood, we can get on towards a finish, for a mere row of sketches of different arrangement will give all the information required, and but little description will be called for.

Fig. 8, A to H, are a few of the different ways that the stem is attached to the work; they are various and general forms of (stirrup) sockets, which are employed when the stem is to be either screwed or pewtered in.

The centre of all of these can be made either from chenier or from a grain of gold run up on a piece of charcoal, in which a small round depression has been made with a doming-punch, or else from a coil of small rings soldered together.

There are yet two ways not spoken of. They are illustrated in Fig. 5 and Fig. 10. The first is where the stem is soldered straight into the ornament, which will be either globular or egg shape in form, such as a pearl or a lapis, gold or coral bead. The other (Fig. 10) is when the ornament (a coin or pearl pendant, may be) is to swing, then this form of stem is used; it is sometimes called the "shepherd's crook."

Additional Means of securing the Ornament.—Fig. 5 has already shown one direction in which attempts have been made to obtain more security for scarf pins; another class of additions for the same purpose is indicated by Fig. 11, A, B, B'. These consist of a spike or spikes, which are to be so placed that they will catch in the tie and prevent the pin riding up.

Fig. 11, A, shows the spike soldered to the stem. Now, as this cannot be screwed in the socket, it must be pewtered in to make the part that fits the socket, and the socket itself either square or oval; this is, of course, to prevent the stem turning. The pewter solder might hold it all right, but it is not worth while to trust to it more than is absolutely necessary.

Fig. 11, B, is a double spike arrangement, which you see is part of the "stirrup," consequently part of the head of the pin. To use this one will mean that great care must be exercised in getting the points hammered hard after the work is coloured—the very last thing, that is. The points themselves should be polished bright.

Another way of obtaining extra security is to form the end of the stem into a screw, and make a nut to fit on it. Any shape nut will do, providing that it is large enough for the wearer to handle conveniently; but one of butterfly shape (Fig. 12, A, B, C, D) will lay flat, and would be more comfortable to wear than one like Fig. 12, E or F. This screw and nut arrangement is the best for safety, and is consequently the one generally employed, in spite of the way which the screw catches the silk.

The stem, when used with these, requires fixing firmly, for it has to resist the nut's withdrawal. Several times have I had the pin given up to me as finished, ready to send to the customer, and on trying the nut I have had the pin-head come off instead. This sort of thing does not improve one's temper much, neither does it do much to heighten one's opinion of the workman.

The more I see of life, the stronger grows the feeling that to succeed, all that is necessary is a little common sense, conscientiousness, and industry. Ability to make articles well goes for little or nothing when such little discrepancies as the one above referred to are continually cropping up—and they do crop up almost daily. In a former paragraph, the way to keep a stem steady when pewtered is spoken of.

The last dodge for preventing loss that comes to mind is that of a perforated stem, like Fig. 12, G, where a common pin is intended to be pushed through the scarf and the stem. Many other ingenious ways have been brought out from time to time, but as they have not got into very general use, it does not appear worth while to describe them.

Combined Pin and Stud.—Perhaps this is the place to say a word about the ornaments now made to do duty as both pin and stud. Perhaps it is; but as nearly the whole of them make a good stud and a bad pin, it occurred to me that this matter more properly belonged to the paper yet to be written on Studs.

However, as it may be a long time before that gets printed, I have decided to allude to the matter here. It is a matter of every-day experience for me to have these studs and pins through my hands, and it is almost a universal custom, I find, to put the screw right in the centre. Now, for a stud that may be all right, but for a scarf pin it is not right; it cannot set properly in the scarf, as you can see by taking a walk where the wearers of such things most do congregate. Apart from that, you and I know that it is necessary, five times out of six, that we should be able to keep one direction of the stone—up and down, as it is called—either on account of such shapes as oblongs, drop shapes, or ovals, or to retain the proper position to show off the play of light in a cat's eye or moonstone.

To attain this fixed position of the ornament, as well as to get it to fit better on the scarf, I carry out this notion whenever the size of the ornament allows me to do so. It is simply to put the screw above the centre; this tends to keep the pin steady, and when used as a stud no inconvenience is found if the pillar of the stud be made oval: the screw, of course, fitting in one end (not the centre) of the oval pillar. Fig. 13, A, will show all the details of this, while the ordinary method is shown in Fig. 13, B. Another way is shown in Fig. 13, C. Here the screws are much larger in diameter; and as but two or three turns can only be used, it is well, where possible, to add a small screw, S, which will pass through both mounts, and so prevent the small amount of unscrewing which might result in the entire loss of the jewel.

A paper on Scarf Slides will follow this shortly.

A WARMING PAN.

BY J. L. D.

A MOST desirable bed companion in cold weather is a jar or bottle of hot water tucked away somewhere in the region of the feet. A jar, however, possesses some disadvantages. Its capacity is limited, its shape is not often all that could be desired, and its cork sometimes does not perform its duty with becoming propriety.

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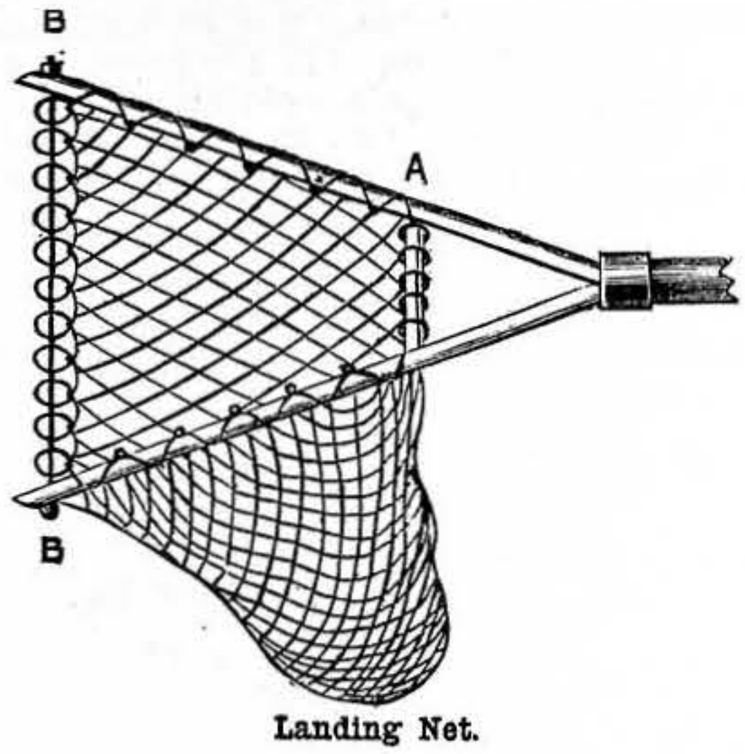
To remedy these defects, I was asked to design and make a tin receptacle for hot water, which would not alone keep the feet comfortable, but act as a warming pan by being placed in the middle of the bed half an hour before its owner. I decided that in shape it should be oval, and its length one foot. For its construction I procured a sheet of best tin, 12½ in. by 17 in., and bent it over a broom handle into an approximately elliptical shape. The ends I joined together with the familiar folded joint such as is seen in almost any tin-plate vessel. I also ran a little solder along the joint. I found, on measuring, that the ellipse was 6 in. by 3½ in. I ought to mention that the sheet of tin was bent so that its greater length was round, the body of the warming pan being thus a little over 12 in. long. By means of two pins and a bit of twine I drew an ellipse, 6½ in. by 4 in., on a piece of cardboard. This I cut out with the scissors, and used as a pattern. I then procured a piece of sheet copper, 6½ in. by 8 in., and as thick as a threepenny bit, and from it cut two ellipses like the pattern. I then scribed lines ¼ in. from the edges, and flanged the ¼ in. at right angles to the body, like the top of a coffee canister. The flangeing I did over a piece of round iron, 1½ in. thick, and cut square at the end. When first I turned it over with the hammer, there were a number of puckers; but I tapped away at them, and when I thought the copper was getting hard, I annealed it by heating it to redness in the fire, and letting it cool again. I then tapped away again, and soon had the flange perfect. It also fitted the end of the body fairly, requiring only a little touch here and there to bring it into contact.

I then soldered the body and bottom firmly together, using only resin as a flux for the solder. I may here caution my readers against using spirits as a flux—at least, where tin is concerned. I have frequently seen the tin eaten through in holes from the action of the spirit. Before the other end, which we will call the top, is put in place, it would be well to furnish it with a screw-plug and handle. For the former I used a coupling, such as is used in a ½ in. brass cock, and for the latter a piece of wire, ⅛ in. thick, bent so as to fit four fingers comfortably, and fastened to the top with a strip of copper soldered all round. The top may now be put on the body and carefully soldered all round. A kettle of boiling water run in through the plug-hole will soon show whether there is a spot which requires further attention.

should be closed by reeving a piece of twine through the end meshes and fastening it with a reef knot. It is well to make the net deep enough, as otherwise the fish are apt to jump out of it as it is raised out of the water.

A better mode of making the net is as follows:—Net in the usual way a square piece of netting, sufficient to cover the ring to which it has to be attached: then fasten



Landing Net.

a piece of twine to the centre mesh, and attach this to the handle of a door or other suitable place. Now net round the square piece you have made, and a circular net will be formed, having a flat or nearly flat bottom, which will hold the fish more securely than one tapering to a point. In rounding the corners, the needle should be passed twice through the corner meshes, as this improves the shape of the net when finished. It is a good plan to net the last row of meshes—that is, those by which the net is secured to the ring—with double twine or twine of a coarser kind, as these meshes are apt to wear out long before the rest of the net. When the net is finished, it is laced to a ring of some kind with ordinary twine or fine copper wire.

Rings are made in a great variety of shapes. Stout iron or brass wire bent into form, with the ends turned outwards for two or three inches, so as to form a tang to go into the handle, answers very well, though it will be rather cumbersome to carry about. A great variety of collapsing rings may be purchased at the tackle shops. These usually screw into a handle, and thus take up but little room. The handle, when made of bamboo, forms a convenient receptacle for an extra top or two. On the whole, the best form of landing net with which I am acquainted is the one I have given an illustration of. The wood must be sawn down the centre for about twenty inches, and a ring or lasting passed round the end of the cut to prevent splitting. A short cross-bar is then inserted, as shown at A, and the ends secured by twine, as at B. The net is then laced on in the usual way.

ABOUT LANDING NETS.

BY LANCELOT L. HASLOPE.

THE easiest way to make a landing net is to net a sufficient number of loops on to a foundation as already described in WORK, and then to join them together into a circle by taking up the first loop that was made. If each succeeding loop is now taken up, a tubular-shaped net will be formed. When it is considered to be long enough, one end

MODE OF LENGTHENING A REVOLVER SIGHT FOR LONG-DISTANCE SHOOTING.

BY JOHN CHARLES KING.

THE revolver for military use is effective for aim only at close quarters. There are times when a dismounted cavalry-man who is without a carbine would be glad to use his revolver for a hundred yards mark, but with sights so close it is almost guess-work to attempt an aim at that distance.

His sword in this emergency might serve him well, if it were arranged for the purpose, and the revolver had staples to take the point of the sword to hold it up, the soldier using the sword-hilt as a butt to put to his shoulder, and a detached hilt-piece for sight and trigger, as shown by the annexed illustration. The revolver to have two flat staples on near side of butt, as shown, the rear staple to have a tightening nut screw to secure the sword to the revolver. The staples are lined with ebonite, to prevent abrasion of blade, sides, or edges.

Description of Sword.—A sliding peep-sight forms a part of the hilt, but detachable by sliding forward to a fixed limit, there to be secured by a spring stud, which engages into a recess in the side of the blade. This peep-sight has, at its lower edge of slide, a projecting piece terminating in a jointed trigger; at the point of this trigger is a small hole to take a bit of woven wire or whip-cord of suitable length to reach the revolver trigger, so that the movement of the sword trigger acts on the revolver trigger for firing. The additions proposed would not affect the ordinary service of sword or revolver.

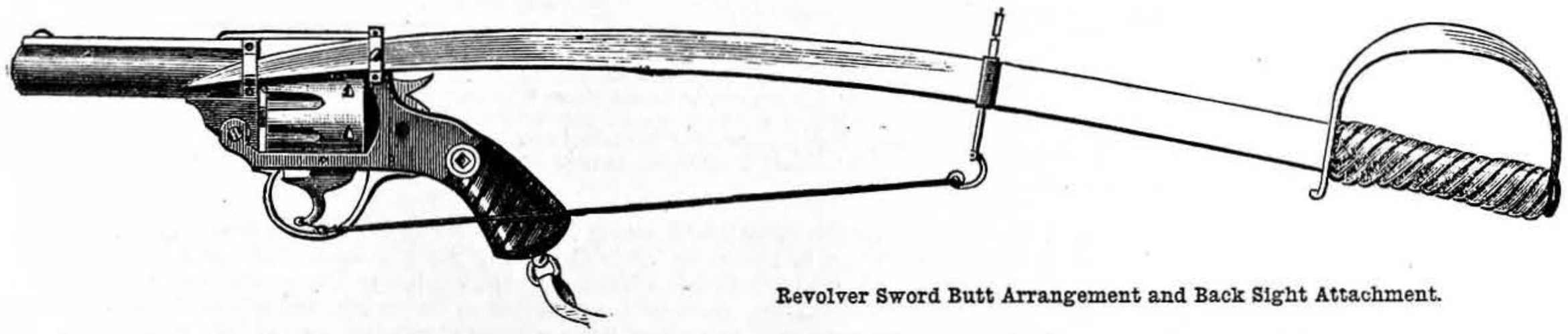
SHORT LESSONS IN WINDOW MAKING.

BY G. LE BRUN.

THE CONSTRUCTION OF CIRCULAR-TOPPED SASHES.

CIRCULAR and Gothic-topped sashes are two of the most difficult forms of windows that fall to the lot of the average house carpenter to construct; and as their use is confined to the more ornamental styles of architecture, they are not of common occurrence in the ordinary workshop: in fact, a man might work at the trade for years, and yet never see a window with a circular top made; therefore, a few general hints on such sashes may prove of use to the young workman, and enable him to better tackle any job of the kind that may happen to come in his way.

The general construction of the sides and lower part of these windows, whether "hung" or "deadlight," is almost identical with the forms of windows already described; but the top part is very much different in its putting together, and will tax the technical ability


Revolver Sword Butt Arrangement and Back Sight Attachment.

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of the worker who is not already versed in their making. A few special tools are necessary for the work. They are a circular-soled hand plane, which may be either an ordinary wooden hand plane cut to suit the required circle, or, preferably, one of the useful adjustable circular planes sold by Melhuish, in which the flexible sole can be bent to suit either straight, convex, or concave work by means of a screw (Fig. 1); a sash router to work the Gothic moulding with (Fig. 2); and a circular rebate plane for forming the glass rebate (Fig. 3). This last may be made by the worker himself, the iron being purchased. In using these tools, you have to fix the work

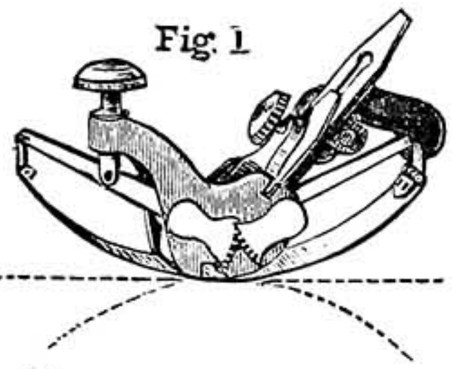

Fig. 1

Fig. 2.

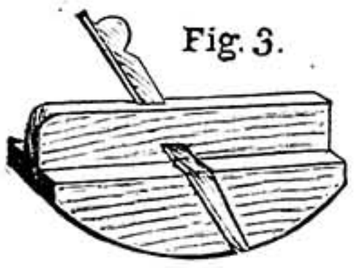

Fig. 3.

Fig. 7.

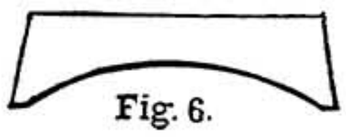

Fig. 6.

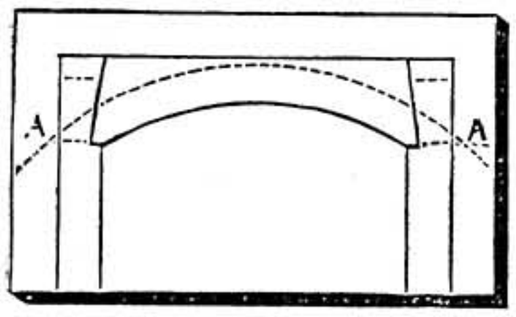

Fig. 5.

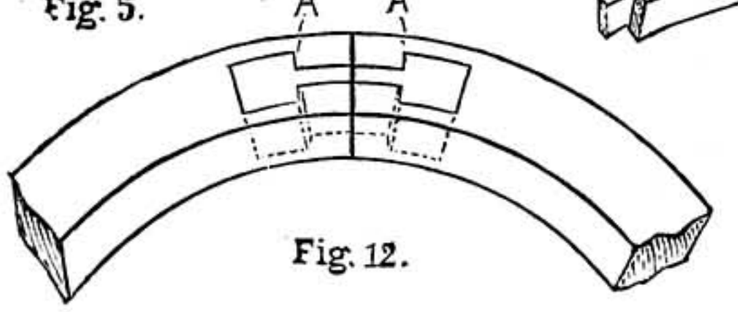

Fig. 12.

the arch. Take a few pieces of matchboard of a sufficient length, drive them well together, nail two pieces of wood across the back to hold them together, and with a coarse hand plane level the overwood at the joints. This is to form a drawing-board. Lay it on the bench, and draw the top of the window full size on it, as in Fig. 5. Take a piece of thin wood, and make a mould the exact shape of the sash lintel between the tenons (Fig. 6). Your sash stuff having been prepared and "set out" in the usual way (so far as the lower part is concerned), take the mould and lay it on the piece for the sash lintel, which should be of a sufficient

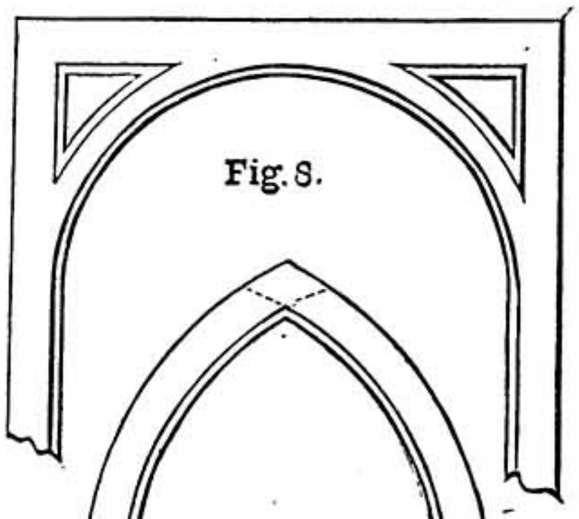

Fig. 8.

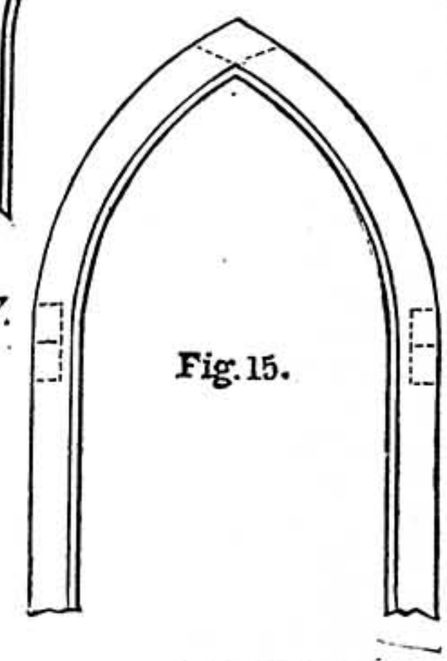

Fig. 15.

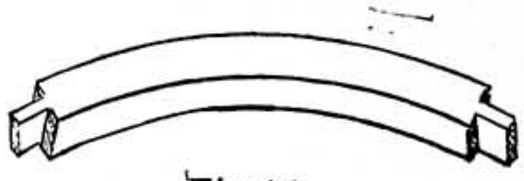

Fig. 17.

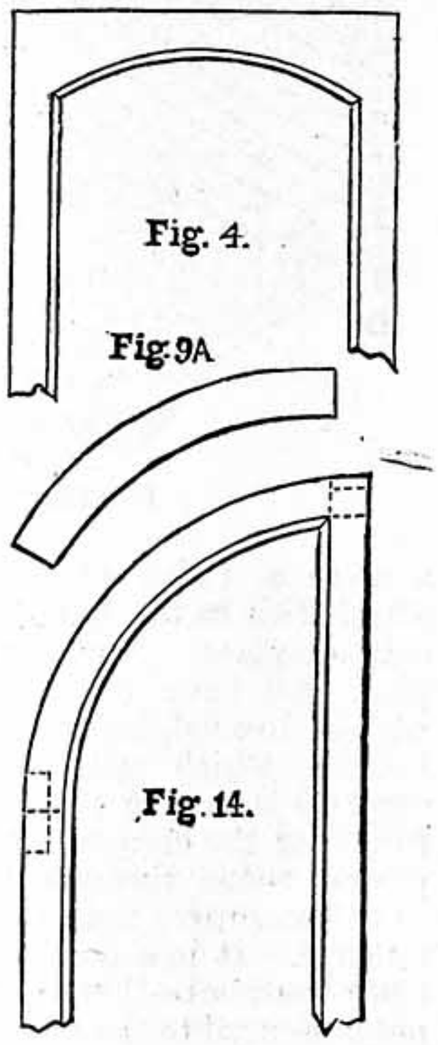

Fig. 4.

Fig. 9A

Fig. 14.

Fig. 13.

Fig. 19.

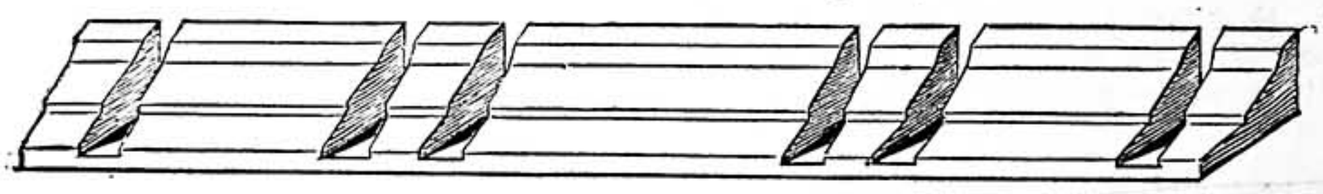

Fig. 18.

circle, which is denoted by the dotted line at A A in Fig. 5. A window of this kind can be made with a much deeper circle than that shown: in fact, the only limit is the width of the stuff you can procure to cut your sash lintel out of; but it presents a heavy appearance on the inside of the room, where the square side is necessarily seen. To obviate this heavy appearance, and still have the simplicity of a square case, the plan shown at Fig. 8 is sometimes adopted, two pieces of framing being inserted in the corners of the window, and the triangular opening thus formed filled in with coloured glass. This mode certainly looks much

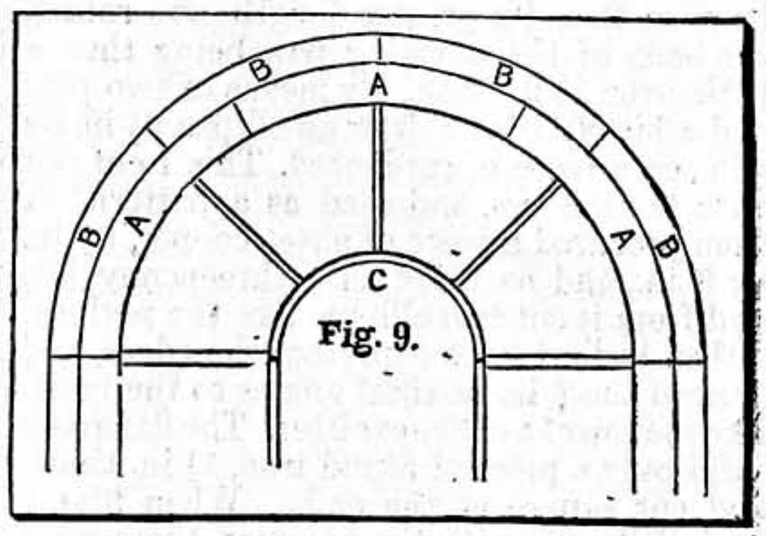

Fig. 9.

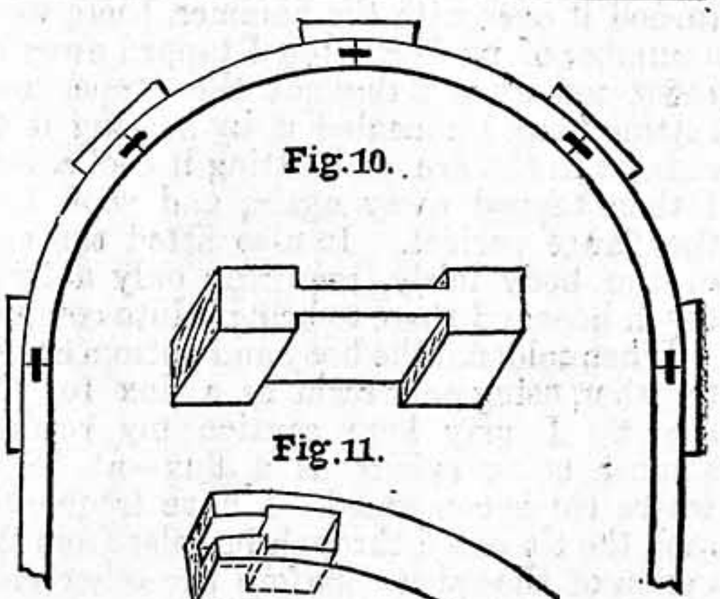

Fig. 10.

Fig. 11.

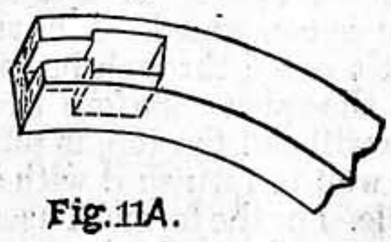

Fig. 11A.

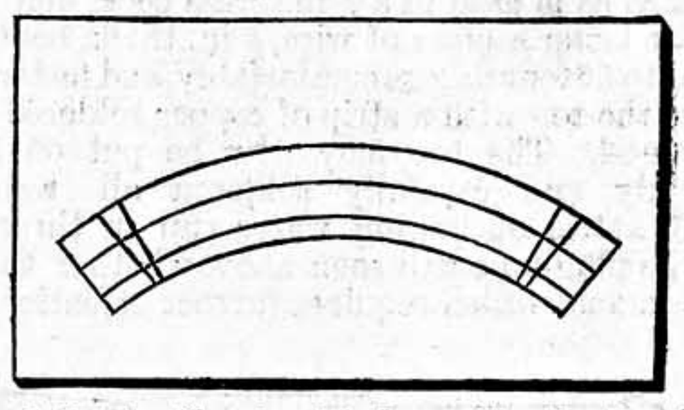

Fig. 16.

Fig. 1.—Adjustable Circular Plane. Fig. 2.—Sash Router. Fig. 3.—Circular Rebate Plane. Fig. 4.—Top of Simple Circular Window. Fig. 5.—Board with Drawing of ditto. Fig. 6.—Mould for Sash Lintel of ditto. Fig. 7.—Top Part of Sash Tile cut in for Lintel Shoulder. Fig. 8.—Circular-topped Sash for Square Case. Fig. 9.—Drawing-board, with Drawing of Circular-topped Case and Hung Window. Fig. 9A.—Mould for Segments of Sash Top. Fig. 10.—Case Top, showing Mode of joining Segments. Fig. 11.—Shape of "Key" for joining up Sash Segments. Fig. 11A.—Mortise in Segment to receive "Key." Fig. 12.—Mode of keying Segments together. Fig. 13.—Mode of building up Sash-bar. Fig. 14.—Top Part of Gothic Window. Fig. 15.—Another Form of ditto. Fig. 16.—Board with Drawing of Circle Window for Corner or Turret. Fig. 17.—Rail of Circle Sash. Fig. 18.—Sole for Three-light Hung Window. Fig. 19.—Sash-bar for Plate Glass.

firmly in the bench jaws, and work from both ends of the piece of curved wood towards the centre where the grain meets, as if you were to work the planes right round the circle, part of the wood would be torn up, and the job spoiled. This little matter will, however, at once make itself apparent to you when you commence the work.

One of the simplest forms of shaped window is that shown in Fig. 4, and in which the lintel of the sash, owing to the slight curve, is worked out of one piece of wood. To obtain the curve, lay a straight-edge across the wall opening, the ends just touching the spring of the arch; then measure the distance from the straight-edge (at the centre of the opening) to the top of breadth to allow the same width being left at the thinnest part of the circle after it is cut as the width of the rest of the framing; mark it accurately at the ends and round the inside edge; cut out the circle with a narrow saw, make the tenons, and proceed to work out the glass rebate and mouldings. When finished, lay on one side, and mortise the stiles; after mortising, cut out the piece as shown in Fig. 7, to fit the bevelled shoulder of the lintel rail, which carefully fit into each stile, and then finish off the window in the usual manner. In a double-hung window of this description the case is made square in the ordinary way, the outside facing on the case lintel being kept wide enough to cut out to the required lighter than the solid wood, although entailing more labour. The size and bevels of the circled corner pieces are taken from a drawing made on a board, in the same manner as the previous example.

We now come to the real circular-topped window, where the whole of the top part, both of case and sash, must be worked out of the solid. The first thing to be done is to lay down the full-size drawing of the top of the window on the board, as in Fig. 9, in which A is the sash, B the case, and C the sash-bar. The top of the case may be in three or four pieces—more if the window is large. In this instance we will suppose it in four pieces, and the sash in three pieces: these pieces must be of an equal size, so that

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one mould may do for them all. Make a mould for a segment of the case top (Fig. 9 A) and another for the sash top. Keep these moulds, say, 1½ in. longer than the exact size of the segment, as you will require a little extra length to allow for working. To get out your stuff, select a good piece of wood, of the requisite breadth and thickness. For the sash it will be 2¼ in. thick, while the case will require 6½ in. These can, by dint of much labour and an extraordinary amount of perseverance, be cut out by hand; but if at all within reach, take them to a saw-mill, and have them cut by a band-saw. Of course, in marking them off you will keep them full to the mould, so as to allow a little for loss in working.

Having the stuff cut, work it carefully to mould; lay it on the drawing-board, and mark it accurately for cutting; fit the joints together by means of a plane; try the segments together on the board while you are jointing them, so that you may keep accurately to the circle. When you have both the case and sash stuff jointed, it will be ready for putting together, which is done in the case top by grooving the ends of each segment and inserting a slip of hard wood, and by screwing pieces of wood of the same width as the case top, and curved to fit, on the outside. This method of jointing is shown in Fig. 10, and both slips and clamps should have a coat of warm glue. The same method is used to fix the ends of the circle to the pulley stiles of the case.

The sash top is put together by means of what are termed "keys" of hardwood (bolts and nuts are sometimes used). Their shape is shown in Fig. 11; the ends of the segments are mortised to receive them (Fig. 11 A), and they should be about ¾ in. less than the width of the sash stuff. Keys and mortises must be well smeared with thick white lead, and secured by driving in wedges, as at A, A, in Fig. 12. The lower parts of both case and sashes can now be put together, the tops attached, and the whole finished off. The sash-bar should be built up of two thicknesses of wood cut to circle, as in Fig. 13, the different pieces overlapping each other, and thus giving greater strength. The finished sizes must be taken from the board, and the mortises made for the reception of the straight bars, after which the moulding can be worked.

The case and sashes being ready for fitting, that operation is the same as described for hung sashes, but a little more care is necessary to fit the top sash correctly. If the window is a deadlight, little fitting into its place will be required—that is, if the sizes have been properly taken. Sometimes, as in the case of a hinged window, the sashes are made to open in two parts. Then the construction must be as in Fig. 14, where it will be seen the curved piece of the framing is secured to the long stile by the ordinary mortise and tenon, and the short stile by means of a key.

Fig. 15 shows the top of a Gothic window, which is halved at the apex, and secured by being well screwed together from both sides, keys being used to attach the top part to the stiles. In a flat-headed Gothic window this arrangement would be reversed, a key being used for the apex, and the stiles halved for the bottom.

In the construction of all the foregoing styles of window the greatest accuracy must be observed in laying down the drawing on the board, so as to get accurate sizes; and also in making the moulds, marking off the lengths of the segments, and making the joints. For without accuracy in these particulars you cannot expect to make a well-fitted window.

Another kind of circle window, and one a trifle easier to make, is that with a square top, but with a curve outwards—such as might be used at the corner of a house or in a turret. In this case we lay down on the drawing-board the curve of the window-sill (Fig. 16), from which drawing we get the curves and sizes of the case, sole, and lintel, and the sash-rails. Moulds will be required as follows:—One for the case sill, which also serves for the case lintel; one for the rails and bars of the lower sash; and one for those of the upper. The case and sashes are put together exactly as in the square form, the sash stuff being mortised and tenoned as usual, the bevels of the tenons being got from the board. Fig. 17 shows a rail with its tenons cut. The one great drawback to this form of window is the difficulty of procuring glass for it, as the panes must be bent to fit the curves, and are comparatively expensive and difficult to procure, especially in country towns, where much delay in replacing a broken pane would be found; in fact, I have oftener than once been compelled to wait for over three weeks for a piece of curved glass to replace a broken pane, to say nothing of the trouble and annoyance caused to the inmates of the house. Still, these curved windows have their uses, and must be made when occasion requires.

In all the forms of windows described in this paper the sash beads, parting beads, etc., for the curves must be worked out of the solid, the curves for them being got from the drawing-board.

It sometimes happens that two or more windows have only a thin stone mullion between them, and very often houses are built with three windows in a group—a large one, with a smaller on each side. When this takes place, the windows, if hung or hinged, generally have their cases made as one. The sill of a hung window of this sort is shown at Fig. 18, with the cuts for the pulley stiles (the case lintel is cut in the same way), and should clearly explain the construction, which otherwise is the same in all details as an ordinary case.

If plate glass is to be put in sashes, the glass rebate should be at least 5/16 in. deep, and this remark will apply to all the forms described in these papers. Where there are sash-bars, they must be kept heavier than those in a window that is glazed with sheet glass, and usually are about ⅞ in. or 1 in. thick. When the moulding and rebate have been run, they show a section like Fig. 19.

To fully enter into all the details and intricacies of circular and kindred sashes would fill many complete numbers of WORK, and is far beyond the scope of a necessarily short paper like this; but the intelligent workman, having his wits about him, may gather from these few hints some idea of "how the thing is done."

MANDOLINE MATTERS.

BY MADRILENA.

THERE are probably other readers of WORK besides the writer who intend to follow the admirable instructions given by "J. G. W." on p. 229, Vol. II., as to how to make a Mandoline, therefore the present article is likely to be of service. Although it may, as a rule, be true that whatever is now made is superior to what was constructed centuries ago, it is by no means so certain that this applies to "shell" instruments—of which large family the mandoline is a member. In fact, the most cursory glance at a number of ancient models will convince the reader that the latter embody elegances which are wanting in modern examples, and which appear to have lapsed into desuetude for no sufficient reason. As an example, take the modern neck, which has the section shown in Fig. 1. Contrast with this the ancient form, of which Fig. 2 shows a section. The groove running the entire length of the latter *must* be a great convenience, and must necessarily facilitate good stopping or fingering. In this groove the thumb travels. Here, then, is tip number one for such as are contemplating the construction of a mandoline. The form of back shown in Fig. 3, and which was copied from a Chiterna of the seventeenth century (Italian), is also one which might be revived to

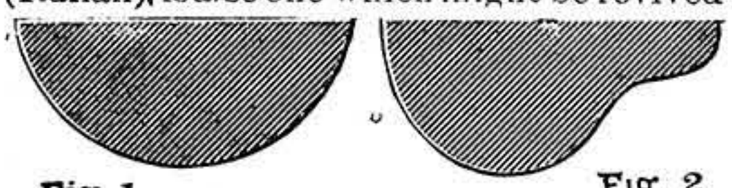

Fig. 1. Fig. 2

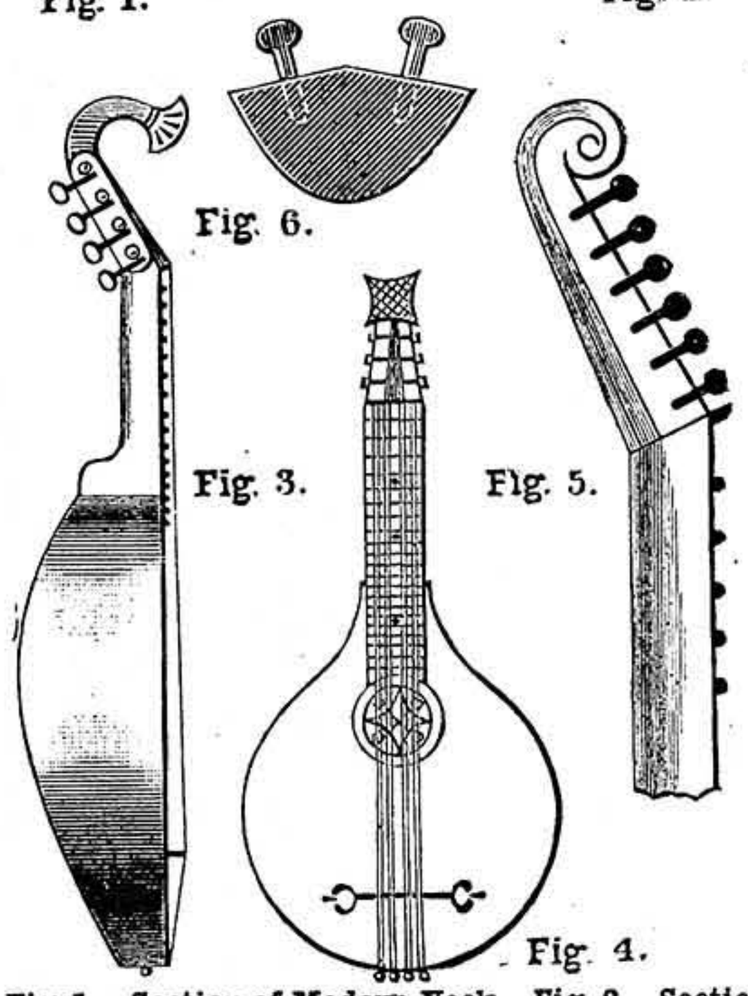

Fig. 6. Fig. 3. Fig. 5. Fig. 4.

Fig. 1.—Section of Modern Neck. Fig. 2.—Section of Sixteenth and Seventeenth Century Neck. Fig. 3.—Side Elevation, showing Shaping of Back and Head. Fig. 4.—Front Elevation, showing English Cithern Model with closed Rosette. Fig. 5.—Rough Sketch of Ancient Solid Head. Fig. 6.—Section of Solid Head, showing method of fixing Pegs.

advantage, especially as it involves no difficulties in the making, while the model for the belly may well be copied from our old English "Cithern," as in Fig. 4. This figure also shows the "rosette," or sound-hole, *pierced* instead of cut out. In some of the old instruments which the writer has recently inspected these saw-pierced rosettes are marvels of beauty, whether perforated through the belly direct or inserted in thin brass or gilded wood. Such ornaments have only fallen into disuse since makers have ceased to consider themselves artists, and, as tradesmen, have wanted to display a label. The graceful finish to the head in Fig. 3 is also easy of accomplishment, and offers great scope for ornament in the way of carving, etc. The machine there shown is, of course, a modern innovation. For such intending makers as are not skilful workers, or who do not care to go to much trouble, the old solid head, with the pegs on the front, will also prove a welcome "tip." This is shown in Fig. 5, where, however, only one of the two rows of pegs is given.

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Its construction will be seen from the section, Fig. 6. Another "wrinkle" is to make the finger-board slightly rounded on the face, the frets, of course, following the same contour as do the nut and the bridge. This is the rule with Portuguese instruments, and is a help in fingering.

SHORT LESSONS IN WOOD-WORKING FOR AMATEURS.

BY B. A. BAXTER.

Hard Wood.

In the foregoing chapters it has been assumed that the amateur has dealt with wood presenting no special difficulties. The mastery of the simplest tools, and understanding how to mark out in a proper manner the various joints already treated, have, we may be sure, offered sufficient difficulty to the persevering student. But when wood of special beauty of appearance, rather hard, or still worse for the beginner, of various degrees of hardness, is used, the trial of the amateur's patience is severe.

Oak, mahogany, walnut, sycamore, and ebony, all more or less used by amateurs, have this in common; they all require well-kept planes, with the irons not ground too thin or sharpened too rounding, and set in the planes so that only thin shavings are to be removed. Care must be taken to plane the right way of the grain, although it is sometimes very puzzling to decide which is the most favourable direction to plane. As to the saws—better abandon the rip-saw, and in its place use the hand-saw, and for cross-cutting the panel-saw. It will be found that hard woods have a very different appearance, according to the relation of the plane of the surface to the diameter of the tree. Thus, when, as in the centre boards, the surface nearly coincides with the diameter, not only are the boards of greater value because of their greater width, but also because they contain, in the fullest extent, the beauty and character of each variety of wood.

Therefore, to obtain the best effect from the harder woods, it is needful to make the cut across the centre of the tree. The surface of the board is then parallel, or nearly parallel, with those radial lines which run from the centre to the outer surface of most of the hard woods. If the end grain of a piece of oak, beech, or sycamore is examined, my meaning will become clear. In cases where a pair or a set of panels are to be made, and the grain of the wood is not obscured by paint, it is best to have all the panels alike in appearance; or, if that is impossible, arrange them so that the eye is not offended by the beautiful appearance of one panel and the poverty of grain exhibited by the next. Oak, in the form of staves (6 in. wide, 3 in. thick), always has the grain in a favourable way for panels. In every case obtain boards long enough for all the panels required, or by two consecutive boards.

A tool is needed to clean off the harder woods which I have not mentioned. It is at once the simplest tool and the most difficult to use—merely a piece of sheet-steel or a piece of saw-blade—but the sharpening is the rub. Try to do it thus: With a little water grind the edge on the paving-stone, holding the scraper upright and aiming at getting a square edge. With a hard steel tool, as a strong bradawl or a gouge having a polished surface, you burnish the edge as if you tried to bring the metal from the edge of the scraper *towards* the angle formed by the edge and the flat surface. Do this to each edge of the tool, and when well done, you have four sharp edges, which will remove a portion of the surface of the wood in a state between dust and shaving, not tearing pieces out of the work as sometimes a plane will do. This tool is a most valuable one, if good, but if too hard, it cannot be sharpened; and if too soft, it will not retain its edge.

OUR GUIDE TO GOOD THINGS.

**** Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

113.—Set of Castings of the Quarter Horse-Power Steam Engine.

It will be within the remembrance of every reader of this, the third volume of WORK, whether they take interest in the subject or not, that a series of papers has appeared on "The Construction of a Quarter Horse-power Steam Engine," comprehensively worked out and carefully written by "F. A. M.," whose initials are well known as being those of a contributor to most, if not all, of the mechanical and engineering serials of the day.

I have had the pleasure of a personal acquaintance with "F. A. M." for many years, and I can speak of him from the experience of these years as an able, practical workman and conscientious writer, who never attempts to handle any subject that he does not thoroughly understand, and who endeavours to the utmost to place any subject that he does take up before the reader in such a way that few can fail to understand all that he says and describes, and who never shrinks from any personal trouble to arrive practically and experimentally at such knowledge as may be needful to enable him to do full justice, first to the matter under consideration; secondly, to his readers; and lastly, to himself.

Such is "F. A. M.," who has described in these pages the making of a Quarter Horse-power Engine from commencement to finish, and I am glad to take advantage of this opportunity to bear testimony to his skill and conceptive power as a practical workman and to his worth as a writer.

Doubtless it will have occurred to many that the utility of the papers to which reference has just been made was somewhat marred by the fact that, in making the steam-engine described, it would be necessary for the workman to make patterns first of all, and secondly, to get castings of the patterns before he could enter on the work of fitting and putting the parts together to make the steam-engine itself. It appeared most necessary, both to "F. A. M." and myself, that every would-be engine maker should be able to avail himself of a set of castings of all the parts ready to hand, and with this view the needful patterns were made under the personal superintendence of "J. H.," another valued contributor to WORK.

I mention these facts because I think it desirable that every reader of WORK should know something of what I may call the secret history of these matters, and that they may gather, from a knowledge of that which has been done in this case, that all who are concerned in the preparation and production of WORK do all that lies in their power to benefit its readers, and are taking thought for them even while it may seem to those who are not behind the scenes that they are careless and indifferent to the appeals and expressions of those who seek their aid.

Well, the castings of this engine are now in existence, and may be easily obtained by anyone who may wish to have them. Further, a complete set has been sent to me for examination, and I am happy to be able to testify to their excellence. Forty-four castings and forgings are required for the engine alone, and these may be purchased for £1 9s. 6d.—no very great sum when their number is taken into account, and the value and power of the machine that they unite to form. Beyond these, twelve more castings are required for the feed-pump, costing 5s., and ten more for the governor, costing 3s. The necessary lubricators, stop-valve, etc., can also be obtained, and all the screws and nuts.

Everyone, I think, who purchases the castings should order the cylinder bored, and the fly-wheel bored and turned. This work will be carried out by the maker of the castings and forgings for 15s. 6d. It is machine work not usually done by the fitter, who will have plenty of work to do, which if he accomplishes successfully, may think himself fairly entitled to say that he "made the engine."

The reason that there are such a large number of parts is because everything has been done that can be done by the pattern-maker and moulder to help the amateur workman; for every little brass nut a pattern has been made, and some of the castings are very small. Amongst such a multiplicity of small etceteras, it is very easy to make a mistake, and I was very anxious that a conscientious person should be persuaded what may even now prove to be an unprofitable task—I mean to the man who makes and sells the castings, and not to any individual buyer, who, at any rate, gets excellent value for his money, and who, if he be possessed of skill and patience enough to put the parts together in a workmanlike manner, cannot fail to find himself on the right side of the hedge.

Mr. Henry Milnes, of Bradford, whose advertisement appears in our "Sale and Exchange Column," is the man who has laid hold of it, and he is determined to do the thing properly, whether it pays or not. Anyone who wishes for a set of castings to work up during the fag end of this ungenial and trying winter, from which those who are left of us will soon emerge, and the coming spring, may send him their money in perfect confidence that they will not be disappointed.

114.—Calvert's "Mechanics' Almanack."

All workmen, whether amateur or professional, will find Calvert's "Mechanics' Almanack and Workshop Companion," published by Mr. John Heywood, of London and Manchester, a useful addition to the practical *vade mecums* with which they provide themselves year by year. Of the usual almanack matter that is found in this, in common with other year-books of this class, I need say nothing: it is, indeed, in the incidental brief papers, tables, and special information on matters of interest to workmen of all trades and callings involving manual labour that its main value consists. It contains a useful Wages Table, for example, for a week of fifty-three hours; a short article on "The Art of Doing our Best," which most of us may read and act on with profit; hints on "Human Life and Brain Wear," showing what may best be done to prolong the one and lessen the other; some desirable papers on "The Cost of Maintaining Patents" and "Patent Agents;" and a "Table of the Size, Weight, Length, and Strength of Iron Wire," showing for each number its diameter in inches and millimetres, its weight per 100 yds. and statute mile, the length of a bundle of 63 lbs. and of 1 cwt., the area of section in decimal fractions of a square inch, and the direct strain for wire annealed and bright. Woodworkers will find the notes and remarks on the timbers chiefly used in carpentry in the United States both interesting and useful, and the same may be said of the brief paragraph on the "Strength of Fir and Oak." In point of fact, it may be fairly said that it contains something for everybody, and that no one who takes it up can put it down again without finding some paper or paragraph calculated to instruct and interest the reader.

THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

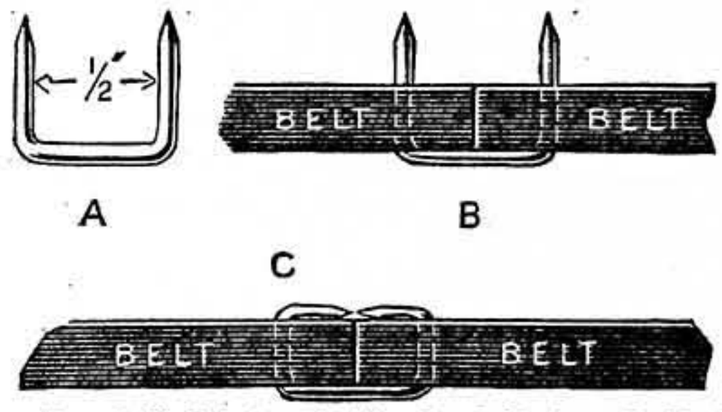
*** *In consequence of the great pressure upon the "Shop" columns of* Work, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given.*

I.—Letters from Correspondents.

How to Frost Cardboard.—Reader writes:—"Hold clear glass in a gas flame until red-hot, then plunge suddenly into cold water, when it will powder itself. Go over the cardboard with a brush dipped in clear gum. Then sift the glass powder on it with a fine hair sieve."

Leather Belting Joints.—E. A. P. (*Tullow*) writes:—"The following is a good way to join round leather belting. Round leather belts are universally used on lathes from 2½ in. to 5 in. centres, and have many advantages over a flat belt but for one drawback—viz., the impossibility of joining them securely. Hooks and eyes of a special make are generally employed, but often fly off and get lost, thereby causing much annoyance. The plan which I have adopted is similar to that by which sewing-machine belts are joined, and is very simple and secure; its only fault is its firmness, as it is impossible to take it asunder without opening



Leather Belt Joints—A, Staple, full size; B, Mode of joining; C, Join complete.

the join. It consists of a U-shaped piece of wire about ½ in. broad, the two upper ends of which are sharpened with a file, and which can be easily made with pliers. Two holes are made in the belt, one in each end; one side of the wire staple slipped through each, the projecting ends turned in and well clinched; then you have a good reliable join, which makes little or no jump over the pulley, and costs practically nothing except a little time and care. Be sure, however, there is no twist in the belt before joining, as it would interfere materially with its working. The annexed sketches will explain my description more thoroughly. A is the staple; B shows mode of joining; C is the join complete."

A Good Furniture Reviver.—E. A. P. (*Tullow*) writes:—"Now that spring is coming round once again, all the gentle sex will be busy with the annual 'spring cleaning,' and, of course, the good man of the house will be expected to provide some suitable mixture with which willing hands and arms will make the chairs and tables shine over and over again. The following is an excellent recipe, all the materials of which can be very easily obtained, even in the most out-of-the-way places. Besides thoroughly cleansing the furniture, it leaves a splendid polish, which has the further advantage of not being easily soiled by finger-marks. Spirits of wine, 1 pint; vinegar, ½ pint; boiled linseed oil, ¼ pint; turps, ¼ pint. Mix the spirits and vinegar first, shaking well till of a creamy colour; then add the other ingredients, and mix all well together, keeping tightly corked. Apply with a clean, dry cloth, rubbing well in, and polish off with a dry flannel. The cloths used must be perfectly dry, as the least moisture is fatal to a good polish."

Gold Lace.—G. E. B. (*Lewisham, S.E.*) writes:—"As I am daily engaged in preparing the material employed in the manufacture of gold lace, perhaps you will kindly allow me to add a few words to the closing paragraph of the reply to L. N. (*Oldham*) by H. S. G. in 'Shop,' p. 667, Vol. III. H. S. G. says, 'Gold lace (so-called) is, I believe, never of gold, but either silver or copper wire electro-gilt.' Some so-called gold lace may be made of such material, but the real gold lace worn on officers' uniforms is not made of electro-gilt silver and copper wire. Lace wire is not made of solid gold, but of silver coated with gold by the fire process. By repeated annealings, the coat of gold becomes embedded in the surface of the silver wire. The durability of this gold coat is determined by its thickness, and this by the price customers are willing to pay for the gold lace. With the price of pure gold at 85s. per oz., only a thin coat of it can be expected on gold lace wire sold at 8s. per oz., and yet this is deemed a fair price to pay for a fairly good material. We are often pressed by competition to quote even lower prices than this. Only a few days ago we were asked to supply a good gold lace thread to sample at 2s. 6d. per oz., the pure gold in the sample itself assaying to the value of 2s. 5d. per oz.! Whilst customers demand skilled labour at such a low price, they cannot reasonably expect manufacturers to sell gold at a loss. If customers are willing to pay a fair price for gold lace, it can be made to wear well and will bear cleaning; but the low-priced lace forced into the market by foreign competition cannot be cleaned. The only way to restore it is to renew the lace."

Hints for Fellow-Amateurs.—H. P. (*Bracknell*) writes:—"A great saving of time and trouble may be obtained by buying common articles instead of the raw material. A rolling-pin of beech may be had for about 3d., and many articles turned out of it without all the roughing-down process, and as cheap as the amateur would buy the rough wood. Boxwood roller-skate wheels, at one penny each, will make a great variety of useful lathe adjuncts without much trouble. Napkin rings also can be made in a few minutes from them. Hard-wood draughtsmen, to be bought at 6d. a box, are useful. A halfpenny, or other bronze coin, makes a good metal washer when wanted in a hurry. A paraffin cask is a mine of wealth for dog kennels, wash-tubs with handles, chicken coops, cupboards, tubs to plant trees in, or as a stand for the greenhouse, using the inside to fumigate plants in; the wood can be straightened, and will make nice oak boxes or frames—in fact, a multitude of articles, according to the inventive genius of the worker. Amateurs generally have to pay heavily for materials, as they do not know where to get things at trade price. The most valuable find for me was Cotton & Johnson's, in Gerrard Street, Soho, where I can get any little piece of metal (silver included) of any dimensions; also any tool under the sun. Another handy place is Allen's, in High Street, Bloomsbury, for castings in brass, gun- or bell-metal. I make my own patterns in wood, and get them cast there at trade price; he has a lot of useful castings in stock, which saves the trouble of making patterns. For those who have no overhead motion on their lathes I would suggest that they buy a spindle, used by jewellers, with a hand wheel; this can be fastened to the slide-rest, and with a few ornamental and cranked drills a lot of useful work can be done. I hope other amateurs will give any little wrinkles they possess to their brethren."—[Yes, it is to be hoped other readers will give wrinkles now that you have set so good an example; but while on the subject of "handy shops" you should have mentioned Mr. Caplatzi's veritable museum, which we have seen, at 3, Chenies Street, Tottenham Court Road, London, as advertised in Work.—Ed.]

II.—Questions Answered by Editor and Staff.

Photographic Expedients.—G. T. (*Liverpool*).—If G. T. will carefully read the article in question, he will find most of his questions already answered. The two pieces of tube are to allow the combinations to be changed. The one attached to the camera by the flange is merely a receptacle for the other pieces containing the lenses. Each piece may contain two lenses of different foci. Only two lenses are used at a time, although more may be. In combining two, the focus will be found to be about half that of the shortest focus, and the stop is to be placed close to the lens in front; but all this was told in the article in question. Read it again. Ask for lenses whose combined foci will be the length required. If you want 12 in., ask for two 24 in., and so on.—D.

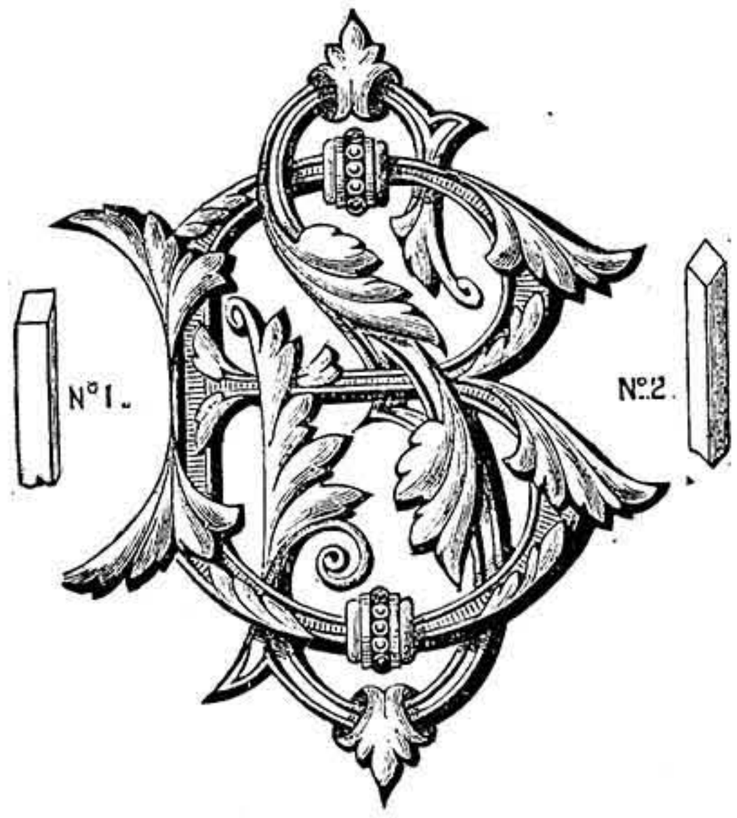
Stereo Metal.—J. H. M. (*Southborough*).—If you will stir your melted metal with a red-hot bar of iron, the zinc will cling to it. Repeat the operation till the whole be removed, keeping the surface skimmed for dross during the operation. The metal containing zinc is of no use either for stereotype or electrotyping. Another plan is to tie up in a rag a piece of borax about the size of a walnut and plunge it to the bottom of the melting-pot, then let it remain till the surface of the metal ceases to bubble. The zinc will rise to the surface and can be skimmed off.—J. F. W.

Wood-Carver's Composition.—J. W. (*Kendal*).—You can very well mix emery powder with oil, so that it makes a sort of paste, and when put on a piece of thick leather, it can be used for the purpose you mention; but it may be considered rather a rough treatment, and fine tools can, at all events, never stand it. The best remedy I know of is the one used by professionals: simply to sharpen the tools by rubbing them slightly over a small oilstone, moistened with some good oil. It may sometimes be rather difficult to obtain these stones, because few shops keep them, but I know by experience that you can get them at the ironmonger's, 379, Oxford Street. I am sorry I have forgotten the name of the firm. The price of them is from 1s.—T. N.

Electro-Gilding with Alloyed Gold.—E. L. (*Wednesbury*).—Alloyed gold may be deposited from an alloyed solution of the double cyanide of gold and potassium, but the process is not easily managed, and the deposit not always certain. The following process is recommended by Elkington and Co., who supply anodes for the purpose from their London works—Myddelton Street, E.C.:—Dissolve 8 dwts. of the alloy in each gallon of solution containing 4 oz. of commercially pure cyanide by the usual battery process. Work the solution at a temperature of from 160° to 170° Fahr., using the alloyed anodes. If the colour is too dark, reduce the density of the current. The anodes for 18-carat gold gilding are advertised at £3 5s. per oz. In my experience with this alloyed gilding I find that the colour varies with each slight variation in current density, which may be brought about by a different size of anode, or size of article being gilded, or size of slinging wire employed, or change in temperature of the solution. I think, therefore, that it would be impracticable to obtain solid articles in this alloy by the electro process. Your question respecting the electro deposition of iron is similar to that of H. C. (*Surbiton*). I fear you would not get "a deposit of iron strong enough to stamp copper." The iron would be very brittle. If you have any useful novelty in electrical appliances, proved by you, send it along on approval to the Editor. If it is worth anything it will appear in "Shop."—G. E. B.

Organ Building.—G. (*Sydenham*).—This subject is under consideration for future numbers. Meanwhile, many details have been explained in "Shop." Purchase the indexes to Vols. I. and II. of Work, price one penny each.

Book-Cover Monogram for Carving.—Amateur Wood-Carver.—Should this design be of use to any of our readers who are not advanced enough to execute it in carving, they could reproduce it, either in wood or metal, by the more simple method of piercing; then, to "relief" the scroll-work a little, the surface of the letters immediately around the ornament should be slightly sunk and boldly lined or "threaded" with a square graver. When sinking and threading, nearly all the cutting



S. B. Monogram for Wood Carving.

should be sloped towards the ornament, the object of so doing being obvious. To finish the ornament, all that is needed will be a few broad, decided graver cuts to indicate the sweep of the scrolls. With regard to the gravers technically termed "squares," two, including handles, can be purchased for about 6d., which should be prepared in the manner indicated above: No. 1 to be used for the sinking, or for even bevelling the edges of the letters, and No. 2 for the lining.—A. C.

Lathe Appliance.—J. R. (*Burnbank*).—Yours is a good and simple way of doing the work, and no doubt was quite effective. It is a kind of spherical slide-rest, except that it can only do hollow curves. A spherical slide-rest is a very old and well-known appliance, and you have not quite attained to it; yet your contrivance is all you wanted for the work you had to do. To make your appliance available for balls as well as hollow curves, the worm-wheel must be down close to the main plate and secured by a loose collar on the pin underneath plate, the top of worm-wheel to have a T slot right across it to take the tool-holder. Then, with a larger and stronger worm-wheel, you could work round the outside of a ball.—F. A. M.

Where to get Tinfoil.—Gas-lighter.—The best firm to supply you with tinfoil suitable for repairing an electric gas-lighter is one supplying materials for the repair of electrical instruments. There should be several such firms advertising in Work, but, unfortunately, there are only a few known to me who care to supply amateurs with small quantities of material. Among the few may be mentioned Mr. Caplatzi, 3, Chenies Street, Tottenham Court Road, who advertises in Work.—G. E. B.

Besoms.—J. S. H. (*Cheetham*).—You should send this information through "Shop," addressed to the Editor of Work.

Boot and Shoe Repairing.—Rex.—Articles have appeared in Work, Nos. 112, 117, 122, 126, 130, and 137.

Waste Products.—Crede Signo.—No such paper as you allude to has appeared in Work.

Capitaine Petroleum Engine.—S. (*Stourbridge*).—No further information can be given respecting this engine than was accorded in the notice in Work to which you refer. We cannot give addresses in these notices.

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Table.—W. S. (*Shipley*).—I will deal with your second query first. You can decide upon the table yourself. You do not say whether you require flaps to it; but by the absence of these particulars I presume that you want an article, the top of which shall be in one entire piece. The height of it should be about 28 in.; the legs (for a large table) turned from, at least, 2½ in. stuff; the length of their blocks depending upon the size of the table. The thickness of the top should be ⅞ in. or even 1 in., and the side-framing ¾ in. or ⅝ in. The method I am going to describe may not coincide with the views of all, but you can make a strong table by following it, with comparatively easy labour. Fig. 2 shows the under-side of one corner of the table. A hole should be there drilled to receive a stout dowel-pin (more than one dowel-pin can, of course, be used to each corner). The lower half of this dowel-pin will enter a hole down the leg-block, as shown in Fig. 1. This diagram also shows how to dovetail-mortise the sides of each block in order that the framing (Fig. 3) may be joined to them. To further strengthen the table, drive a number of screws through the inner side of the framing into the table-top, as in Fig. 6; or by driving them through small blocks as

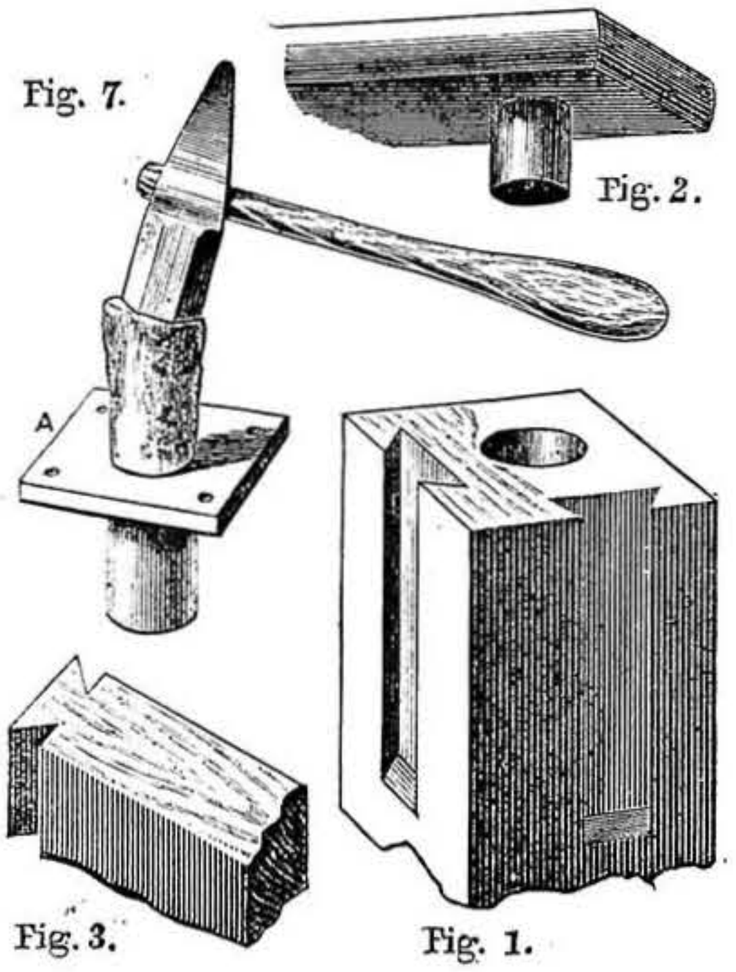

Fig. 7. Fig. 2. Fig. 3. Fig. 1.

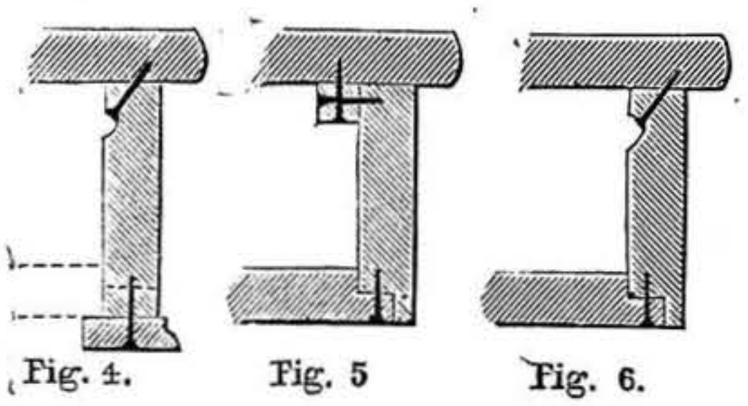

Fig. 4. Fig. 5 Fig. 6.

Table. Fig. 1.—Leg-Block. Fig. 2.—Dowel fixed. Fig. 3.—Dovetail Tenon. Figs. 4, 5, and 6.—Various Sections of Sides. Fig. 7.—Dowel being formed—A, Dowel-Plate.

in Fig. 5. For appearance' sake, you might screw moulded rails to the bottom of framing (Fig. 4). Across the table, connecting the framing, might be screwed stout rails, as shown by Figs. 5 and 6. If drawers are required, allowance must be made for their passage through the framing; and bearers should consist of rails screwed against the framing inside between the bottom rails. For drawer making, etc., read up your back numbers of WORK. Touching upon your first question, I must say you have done more than most do, when they ask two or more questions on different topics, by numbering your queries; but still it is a very essential matter, to ensure a satisfactory reply, that *each question* bearing on a different branch of trade or different trade *should be written on a separate sheet of paper*. How to sole a boot is rather out of my line of knowledge; but there is a member of our staff who gives instructions upon this trade; and to him would have been forwarded the boot query at the same time that the table question was placed in my hands if it had been on a separate sheet. You will not be surprised, therefore, at not seeing it replied to here; but our Editor, no doubt, will have forwarded it to our brother contributor, whose reply will appear in due course.—J. S.

Bending Bamboo.—E. McH. (*Hebburn-on-Tyne*).—Bamboo can be softened and bent either by dry heat, as over a lamp, or by heated steam. The subject is one which has often been brought forward in WORK. E. McH. is specially referred to Vol. I., p. 519, No. 33, and Vol. III., p. 252, No. 120. At the latter place may be seen a diagram of steaming apparatus. In Vol. I. is a series of articles on bamboo work.—M. M.

Microphone Transmitter.—G. C. H. (*New Kent Road*).—Write again, giving full particulars of microphone battery and receiver.—W. D.

Bell Telephone.—J. N. (*Perth*).—I have received your postcard. At present I am away from home, and cannot look up the answer to which you refer. I have not yet seen it, not having had the *pleasure* of reading WORK for the last few weeks.—W. D.

Phonograph.—PATIENCE.—I am sorry to say that I cannot give instructions for making a phonograph in "Shop" column, for the simple reason that space could not be spared for every detail. There is, however, an article in the Editor's hands upon this subject, which he will publish at his own convenience. Till then PATIENCE will have to wait.—W. D.

Telephone.—NO NAME.—The instructions from which you made your transmitter were doubtless all right, and the cause of the failure I am unable to fathom, inasmuch as you do not give sufficient particulars to help me. If you write again, explaining your instrument and the method which you have used for testing, I may be able to help you over your difficulty.—W. D.

French Polishing.—W. L. (*Oldham*).—Damp, rather than cold, was the cause of your polish peeling off; besides, you were very unwise in giving the handrails a coat of thick brush polish in the presence of so much damp. Paper it down again, putting a little linseed oil on the face of the glass-paper, and be content to work it up with the rubber. For this purpose, if possible, choose a bright, dry day; dissolve your shellac in naphtha instead of methylated spirits, and leave the work, if it looks well, in "dry shine"—*i.e.*, from the polish rubber; if, however, it must be spirited out, use naphtha. This may perchance make it necessary to use a little more oil, but be as sparing as possible with it. Do not overcharge your rubber with polish: in such a case as yours it would be best to use a little at a time, and work each rubber out fairly dry before re-charging, bearing in mind that friction, or, more properly speaking, "elbow grease," is a most important factor in gaining satisfactory results.—LIFEBOAT.

Green Stain and Inlays.—C. L. (*Beverley*).—I have several times in "Shop" advised the use of Tomlinson's aniline dyes, as sold at most druggists' in penny packets and threepenny tubes; also verdigris dissolved in hot vinegar. I can still recommend them, though since those replies were penned, I have received from Mr. H. C. Stephens, Aldersgate Street, London (a stain maker of high renown), specimens of a new green stain that appears to me to be very good, and is sold in sixpenny and shilling bottles. The coloured wood stringings and inlays are sold at most places where veneers and carvings are sold for cabinet makers (not saw-mills). I cannot give the addresses of any in your neighbourhood; but if you care to send a shilling postal order to Mr. Kingstone, veneer merchant, Pershore Street, Birmingham, or Mr. Harriss, veneer merchant, Bromsgrove Street, Birmingham, I have no doubt they will send you a variety you would be well satisfied with. Kingstone will undertake inlays to your own designs, if necessary. For the pearls (not shells) you might try Thomas Padmore, Edmund Street, Birmingham. But why not look in your local directory, and find dealers nearer home, where you could go and personally select what you require? I give you a wrinkle that may be of service to you: that well-selected and well-marked bird's-eye maple dyed green makes a capital imitation pearl inlay when well polished.—LIFEBOAT.

Machine for Advertising.—A. H. (*No Address*).—You say that the box has slots in it, so I suppose a card appears through each slot. If the cards appear and disappear at the same time, an arrangement similar to skeleton drawing, Fig. 1, might be used. I am assuming that the box in each case has four slots, and in Fig. 1 that the cards, A, rise and fall together, being fixed to a frame, *a*, fitted with two long bosses, *a'*, *a'*, through which holes are drilled vertically to fit guides, *b*, and with projections at side for links, *c*, *c*. The guides, *b*, can be fitted either to the top of the box or the bottom, as is most convenient. Two bell-crank levers, *d*, *d*, are pivoted at *e*, *e*, the upper end of each being fitted to link *c*, the other ends being connected together by coupling-rod *f*. The reciprocating motion is communicated to them by rod *g*, worked by crank *h*, which latter is fixed to shaft *i*, which is driven, in turn, by small cord-pulley, *j*, on outside of box, through cross-shaft, *k*, and bevel-wheels, *l*, *l*. If the pulley, *j*, is kept turning at a uniform speed, the cards, A, will remain slightly longer at the top and bottom of their travel than in the centre when rising or falling. The full lines show the positions of the levers, frame, etc., when the cards are raised, and the dotted lines when the cards are lowered. Another plan of obtaining the same motion would be to continue shaft *k*, Fig. 1, but now placed centrally under frame *a*, and provided with two cranks exactly under links, *c*, *c*, which links, in this case, must be turned into connecting-rods to grip the crank-pins, and as the cranks turn the frame, *a*, will rise and fall as before. As an alternative plan, suppose you want the two right-hand cards, Fig. 1, to rise together while the two left-hand ones fall: by dividing frame *a*, Fig. 1, in the centre, and reversing the left-hand bell-crank lever to position shown in Fig. 2, keeping the other gearing as it was, this will be secured. By conveying a reciprocating motion to the lower ends of bell-cranks, the upper end of one, together with the two cards, will rise, while the other one will fall. Thus the two pairs rise and fall alternately. The pairs need not be next each other; the first and third and second and fourth, or first and fourth and second and third, might be worked together by a slight variation in the mechanism. Still another method is shown in Figs. 3 and 3A, which illustrate a skeleton longitudinal section and an end elevation of crank-shaft, cranks, and connecting-rods. In this case the cards move alternatively, A being completely out of the box, A', A'' half out, and A''' hidden in box. In this case each card must be carried and worked separately, and have a separate guide and connecting-rod, the crank-shaft, *k*, in this case having four cranks at right angles. Thus you get each card rising and falling one after the other, no two cards being at the top or bottom at the same time. By means of cams instead of cranks, these cards might be made to rise and fall quickly, and remain still at the top of the stroke considerably longer than by the crank arrangement. The style of cam, Fig. 4, I have drawn to a larger scale than the others; *c* is the cam carried on shaft, *k*, and revolving with it; *a*, *a* are the guides for the cards; *d* is the rod to the top of which the card is fixed; while below, in contact with the cam, is a small wheel, *w*, to reduce the friction between the rod

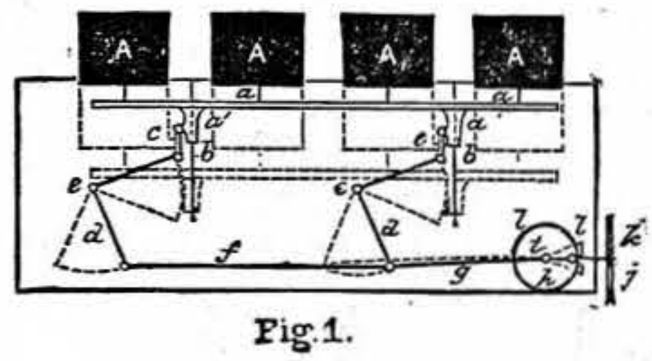

Fig. 1.

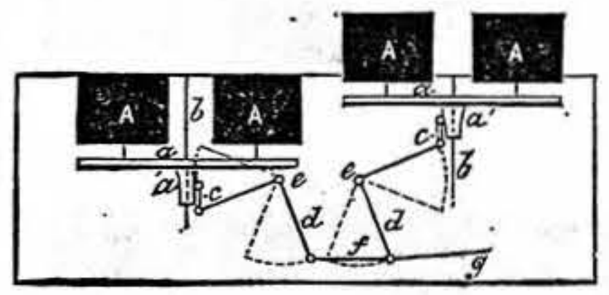

Fig. 2.

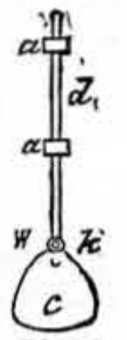

Fig. 4.

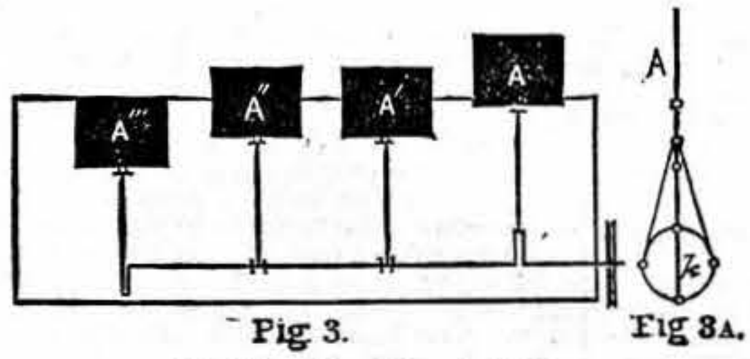

Fig. 3. Fig 3A.

Machine for Advertising.

and cam to a minimum. This shape of cam allows the card to remain stationary in its highest position for one-fifth of a revolution of shaft *k*, thus giving people a better chance of reading what there is on it than in the preceding cases. So if you arranged to have four cards, by setting the four cams at right angles to one another you would nearly always have one of the cards stationary for a short time. There are various methods of driving the mechanism shown in these drawings besides the outside pulley, which, however, if you have a shaft running near, is as convenient as any, and might easily be arranged out of sight of the public; there might also be used a small model steam or water engine. Inside the box you might use electricity or clockwork: which, I think, will prove the best. But the design of the mechanism and power to be used all depend on the size and number of the cards, so I cannot help you any more till these are given.—P. B. H.

Saddlery.—ANXIOUS.—J. Dixon & Sons' address is 24, Hall Lane, Walsall. *Saddlers' Gazette*, 46, Cannon Street, E.C. Monthly, 4d. The saddlers' and harness-makers' trade price list may help you to the lengths of parts. It gives the lengths of the stitching, and stitches to the inch, of every part of harness and saddlery, and trade prices; it costs 7d. J. Barlow & Co., Sedley Place, Oxford Street, W. Doubtless they can supply "Cutters' Lengths" publications, as they are a leading firm in London for all relating to harness and carriage furnishing, wholesale and retail.

Measurements.—DOBRA.—There is not the least doubt but that you would gather a vast deal of information from Cassell's "Technical Educator." It is published in monthly parts, but I should advise you to make inquiries, through your local bookseller, as to whether there is an edition being published now, etc. etc. You would also find Beaton's "Pocket Technical Guide, Measurer, and Estimator," published by Crosby Lockwood & Sons, 7, Stationers' Hall Court, London, E.C., very useful,

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and, as the price is only 1s. 6d., I should certainly try it.—E. D.

Model Horizontal Engine.—F. C. (*Cardiff*) writes:—"I feel thankful for the answer *re* Model Horizontal Engine (see p. 572, No. 141), but what I should like to see is a dimensioned sketch of a model. I may say to F. C., who promised to further help me, that the cylinder I have hasn't got the ports cut in it yet."—[In reply, you do not give me the size of the port face on your casting, but I think I can supply information which will enable you to complete your work. Fig. 1 shows a side elevation of the proposed engine, with the cylinder in section; also a plan view of the connecting-rod, F. Fig. 2 is a longitudinal section of the steam and exhaust passages and the slide-valve. The block is too small to be clearly dimensioned, so I give you the measurements in letterpress. Make the piston, A, $\frac{1}{4}$ in. thick, and turn it to fit the cylinder truly; then no packing need be used. Face off the insides of the covers until the distance between them is increased from $2\frac{1}{16}$ in. to $2\frac{1}{8}$ in.; you can then have a stroke of $1\frac{3}{4}$ in., with $\frac{1}{16}$ in. clearance at each end. The piston-rod, B, should be $\frac{1}{8}$ in. diameter, screwed at one end into the guide-block, D, and at the other into the piston, where its end may be lightly riveted over, to prevent the piston from working loose. The gland, C, should be made to screw into the stuffing-box, which is to be lightly packed with cotton-yarn. The length of piston-rod you must find from your cylinder casting; it must be of such length that when the piston is against the bottom of the cylinder, and the gland, C, just free from the stuffing-box, the guide-block, D, clears easily from the gland. The guide-rods, E, E, should be of wire about $\frac{3}{32}$ in. (No. 13, B.W.G.) in diameter, screwed at one end into the cylinder cover as shown, the other ends to form a light driving fit to holes in a plate, T, fixed to the bedplate, M, and slotted out for the passage of the connecting-rod, F. Thickess of plate, T, $\frac{1}{16}$ in.; of bedplate, M, $\frac{1}{4}$ in. The connecting-rod, F, to be $\frac{1}{8}$ in. thick in the body, $3\frac{1}{2}$ in. long between centres, and made with a forked end, R, to ride at one end on a pin, $\frac{1}{16}$ in. diameter, fixed in the guide-block, D, and at the other on a crank-pin, G, $\frac{3}{32}$ in. diameter.

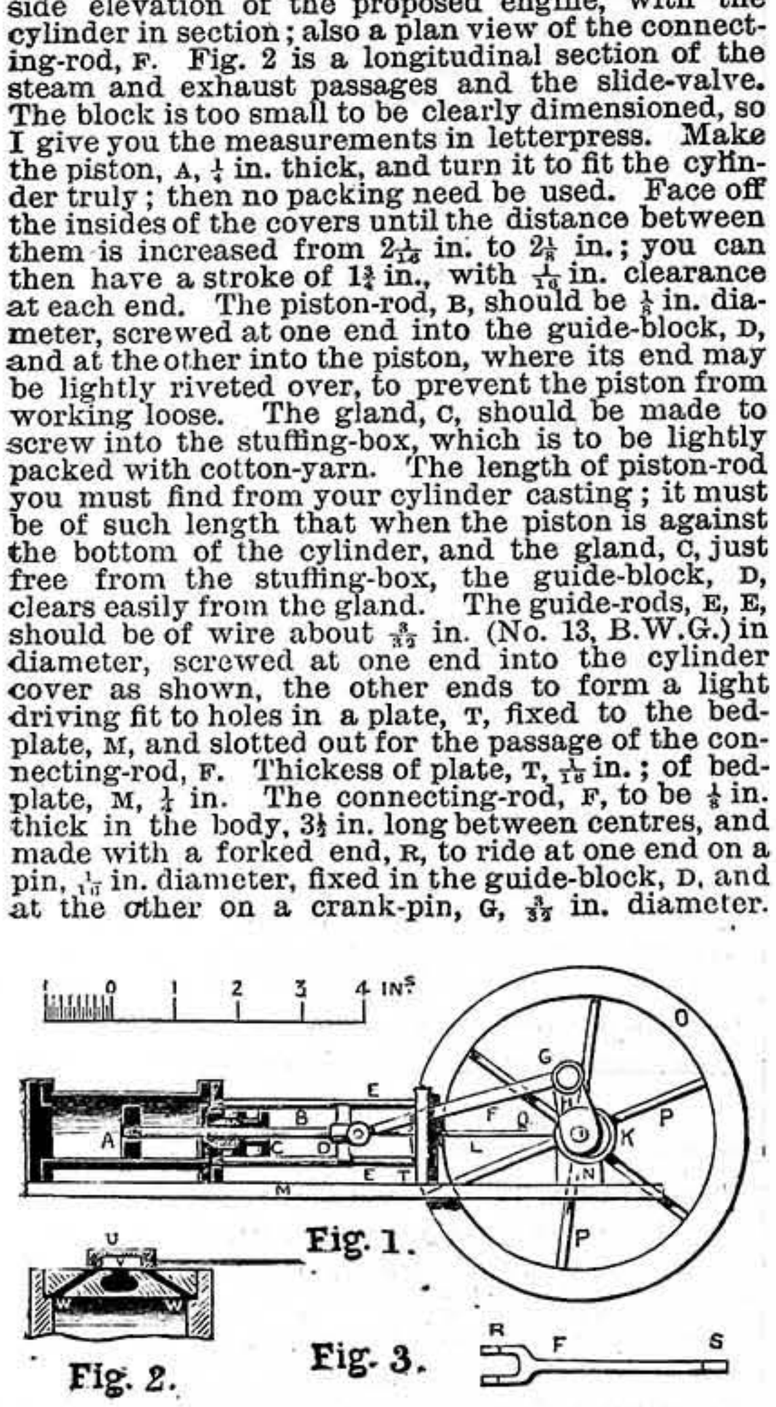

Fig. 1.

Fig. 2.

Fig. 3.

Model Horizontal Engine.

This pin is made with a head, and screwed into the crank, H, through the eye, S, of the connecting-rod. The crank, H, has a throw of $\frac{7}{8}$ in., is $\frac{1}{8}$ in. thick, and is fixed on a main-shaft, I, $\frac{1}{4}$ in. in diameter. This shaft is carried in ordinary bearings on pedestals, N, cast with or fixed on the bed-plate. The shaft carries a fly-wheel, O, $5\frac{1}{8}$ in. outside diameter, with a rim $\frac{3}{4}$ in. square in section, a boss, Q, $\frac{5}{8}$ in. diameter by $\frac{3}{8}$ in. thick, and six wire arms, P, $\frac{1}{8}$ in. diameter (No. 11, B.W.G.). You may have a wheel cast complete, but the arms should then be wider; brass is the material to be used. On the shaft, I, is fixed an eccentric, K, with a throw of $\frac{5}{32}$ in., which, by a rod, L, drives the short slide-valve, U. The exhaust port, V, should be $\frac{3}{16}$ in. wide; space between exhaust and steam port, $\frac{1}{4}$ in; steam ports, $\frac{1}{8}$ in. wide each; edge of valve, $\frac{3}{16}$ in.; inside length of valve, $\frac{5}{8}$ in.; the cylinder ends, W, of the steam ports, $\frac{1}{8}$ in. wide. The length of the ports across the cylinder should be as great as the width of port face will allow. The depth of connecting-rod to be $\frac{1}{8}$ in. at the forked end, and $\frac{3}{16}$ in. at the crank-pin end. The valve, U, to be covered by a steam chest, made to fit the port face. You may have to modify the valve sizes to fit your casting, but there should not be any difficulty in that. The rod L and the valve-rod may be made of wire, No. 16, B.W.G. It is preferable to use steel wire throughout. The crank, eccentric, and fly-wheels may be made driving fits to the main shaft.—F. C.]

Designs for WORK.—J. A. (*Parsonstown*).—Your friend may send in his sofa design on approval. Indeed, I should be glad at all times to receive MSS. and designs from any reader of WORK who cares to submit to me, on approval, particulars of novelties or ideas which are his own work or idea.

Incubator.—W. B. (*Ramsey, Isle of Man*).—As several correspondents wish to know where to get fittings, I will try and arrange with someone to supply the whole. Watch advertisements in sale and exchange columns of WORK.—LEGHORN.

Incubator.—W. H. E. (*Crewe*).—See reply to W. B. above. Replies by post are against the rules.—LEGHORN.

Thermometer.—W. C. (*Wandsworth Road, S.W.*).—See reply to W. B. above.—LEGHORN.

Incubator.—F. W. M. (*Child's Hill*).—The "flower-pot" incubator was described and illustrated on p. 557, No. 35, Vol I. You may, however, as well try to hatch eggs on the hot-plate of a kitchen range as in such a contrivance. Why not make one as recently described in No. 143? If expense is an object, you might reduce size and make fittings of tin—tin canisters, for instance—although I am bound to say they will always be a trouble, rusting through in a very short time. I merely throw this out as a suggestion, because in building apparatus for actual work, it is better left alone altogether if it cannot be built properly.—LEGHORN.

Incubator.—H. H. (*Egham*).—Yours is a very good idea, but more applicable to a larger machine. The glass panels in lid are not very large, so that if you introduce two more rails, you will about do away with them altogether. You need not fear disturbing the regulator by opening and closing lid. Of course, on opening the lid, you disengage the regulator rod with the damper, but as the temperature then falls quickly, it is most probable that when the lid is closed again the regulator rod will be below the top of machine. The taper hole in lid allows a little play in this respect. If you prefer to follow your idea, you might make the centre rail narrower, cutting an oblong hole for ventilation, making the inner rails of lids narrower and hingeing them to the centre rail, screwing a small stop on to prevent them going back too far. If you adopt this plan, you will of course require to adapt the damper to suit the shape of the hole.—LEGHORN.

Photos on Zinc.—A SUBSCRIBER.—It is quite possible for anyone with the necessary skill to produce the work, but like many other things, it requires experience. We are not aware of any work published specially devoted to this subject. It is mostly in the hands of firms who make somewhat a secret of their processes. The zinc plates may be obtained of Dellagana & Co., Stereotypers, Shoe Lane, E.C.—D.

Harmonium.—G. E. L. (*Battersea*).—There is no useful purpose to be gained by adding stops to a portable harmonium. Probably there is only one set of reeds, or the makers would have adopted the very proper and obvious course of adding some way to control the various sets of reeds. If, as I surmise, only one set is present, the only useful stop would be that marked "expression," and the needful alteration to the instrument to add this stop would be greater than its value, and would render the instrument less portable. Fittings of every kind for musical instruments may be had of Messrs. Dawkins & Co., Charterhouse Street, Holborn Viaduct, or from advertisements in WORK.—B. A. B.

Grip Lock Nut.—A. D. (*Sheffield*).—Any stamped letter can be forwarded to the maker, but a free advertisement of his address cannot certainly be given in WORK.

Water Engine.—YOUNG ENGINEER.—Consult Glynn's "Water Power" in Weale's Rudimentary Series.

Draught Screen.—M. T. (*Pilrig, Edinburgh*).—For this, refer to No. 136 of WORK.

Lathe Crank-Shaft on Points.—J. H. (*Keighley*).—Surely you must have seen that this is the usual way of mounting the crank-shaft of a lathe. When you ask how they are lubricated you raise a smile. Put a drop of oil on the centre, just where it goes into the revolving shaft, and it will work its way in; don't pour half a pint, for that will only lubricate the floor. Some workmen seem to use as much as they can; and a nasty mess they make. Cranks for lathes are run usually on points, and I doubt whether any of the new plans are better: they are run on or between three friction rollers, and in bearings, but this requires a special bearing which can adjust itself to the shaft as it bends with the pressure of the foot on the treadle.—F. A. M.

Hot-Air Engine.—J. W. R. JR. (*Liverpool*).—I think you will get the information you need from my reply to another querist. I will only add to that, that as you wish to use yours for working a little pump, you can pass some of the water through the cooling cistern on the top of the heater. I should use a 2 in. or 3 in. working piston, and have a heater of twice the diameter, and the displacer same stroke as the piston; I think that would work a $1\frac{1}{2}$ in. pump. I would not use any packing, but grind out the working cylinder and pump cylinder, and make the working piston of the same metal and same thickness as cylinder, so that heat may not interfere with fit.—F. A. M.

Rocking-Horse.—W. H. C. (*Leeds*).—This subject has not yet been treated; but the Editor has requested me to attend to it, and I will do my best to endeavour to place a page of designs and accompanying descriptive matter in the hands of the readers as soon as possible.—J. S.

Etching.—PROFESSIONAL.—I am hardly sure if I understand just what it is you wish to know; from the wording of your letter I take it you desire to know how to etch letters on glass, although I cannot understand why you have used a stencil. However, if this should not be what you want, write again. Cover the piece of flashed ruby with brunswick black; when dry, scrape away all of it from the parts of the glass you wish the acid to act upon. In your case it seems you wish the ground around the letters to be removed; you will therefore leave all the letters covered with the brunswick black. You ought to have no difficulty in getting the edges of the letters straight this way; you can use a square or straight-edge and a sharp point; if the other way (*i.e.*, the letters etched away), remove from the letters in the same way, and you can afterwards, if you wish, fill up with black. By acting upon the flashed side you can have white letters upon a ruby ground, or ruby letters upon a white ground, at pleasure.—W. E. D., JR.

Silver Chloride Cell.—ELECTRA.—The positive element in a silver chloride cell is zinc; the negative element is silver. The negative element is enclosed in some porous or bibulous material enveloping a paste made of silver chloride. This envelope may be blotting-paper or fine-mesh muslin. The positive element may be enveloped in a similar material charged with zinc chloride or with ammonia chloride, or may be suspended in a solution of either of these chlorides. The zinc should be in the form of a thick plate, as this element wears away. The silver may be in the form of sheet, foil, or wire. The electrolytic action of the cell reduces the silver chloride to pure silver, which is deposited on the negative element. You may use platinum foil as a substitute for silver foil if you choose to do so, but I do not see what advantage will be attained by the change, since the foil is soon coated with pure silver, and the electro-motive force of the cell is then that of the difference in potential between silver and zinc in an electrolyte of chlorine, not that of zinc and platinum.—G. E. B.

Oak Work-Box.—J. H. T. (*Earlsheaton*).—Without knowing the abilities of J. H. T., or what tools he possesses, it is difficult to advise, but such work-boxes as he can buy at the shops are made in pine, just like a packing-case (see Fig. 1). A rebate is made on all the angles except the bottom; this rebate is filled with hard wood like the box is to be

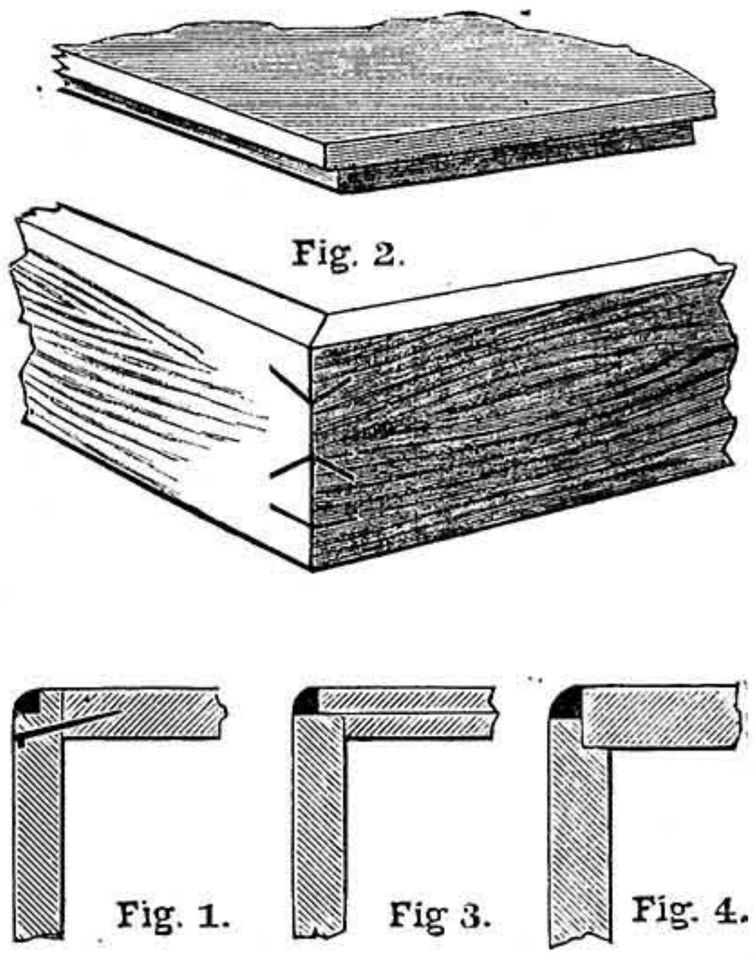

Fig. 2.

Fig. 1. Fig 3. Fig. 4.

Oak Work-Box. Fig. 1.—Section of Corner of veneered Work-Box; the black quarter circle is hard Wood let in before the Veneer is laid. Fig. 2.—Box with mitred Angles, keyed, Top rebated, and end grain hidden by insertion. Fig. 3.—Section of Fig. 2 when completed. Fig. 4.—Section, if the Sides and Ends are rebated instead of Top. (Not drawn to scale.)

veneered with. The ends, back and front, and top are then veneered, and the inserted hard wood just mentioned becomes available to make a nicely rounded corner. The box is then cut, thereby forming a lid, having its dimensions and figure of grain corresponding with the box itself. The edges of the cut surfaces are then veneered; hingeing, cleaning off, and the fixture of lock, escutcheon, etc., complete the box. This is the simplest way to make a work-box, but it is only available for veneered work. For solid wood, dovetailing is the best way, but if that is too difficult, I should mitre the sides and ends together, keying the joint with hard wood (see Fig. 2). In that case I should prepare a rebate for the top and bottom to rest in, and round the top insert a piece of hard wood as a finish, and to hide the end grain (see Fig. 4). Fig. 3 shows rebate on top.—B. A. B.

III.—QUESTIONS SUBMITTED TO READERS.

*** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Upholstery.—V. L. (*Bayswater*) writes:—"I should be obliged for some hints on upholstery, a branch of industry which I hope will soon be treated by your exceedingly useful journal. Should space not allow of an extensive article being devoted to the subject, I should be glad of the names of any good works on the subject."

Address Wanted.—TRANSPARLEUM writes:—"Will some reader of WORK please give me the present address of the Continental Novelty Company, late of 50, Leicester Square, London? The above was the address about four years ago."

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Saw.—E. J. (*Borough, S.E.*) writes:—"Would W. W. (*Caverton*) oblige a brother reader by stating in 'Shop' what number or numbers in WORK I can find how to make a saw same as that of which parts are described in 'Shop,' No. 144, p. 637, Vol. III., in answer to TOP SAWYER?"

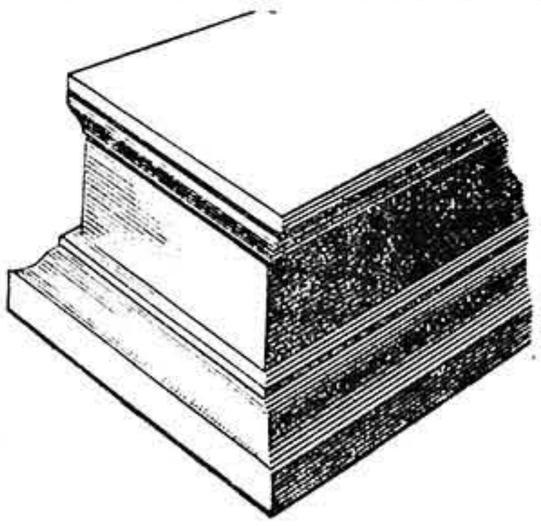
Antique Furniture Designs.—H. R. (*Kidderminster*) writes:—"I would be very glad to learn the price of, and where I could get, a book of patterns for carving antique furniture, such as old chests, wardrobes, cupboards, clock-cases, bookcases, and panels in other odd furniture—not necessarily in their full size, but large enough to sketch from to any size needed."

Millboard Boxes.—J. W. (*Upper Norwood*) writes:—"I shall be obliged if any reader would give me a description for making a hand machine or appliances for making small millboard boxes (5 in. × 1½ in. × 1 in.) in quantity—similar to those photo plates are packed in—in the columns of 'Shop.'"

Wood.—J. B. (*Birmingham*) writes:—"I wish to make a set of pigeon-holes with fifty-four compartments, but have a difficulty in obtaining the necessary wood. Could any reader of 'Shop' inform me where (close to Birmingham or West Bromwich preferred) I could get the wood, in pine or deal, planed and cut to the sizes I require, ready for putting together?"

Tailoring.—ANXIOUS writes:—"Can any reader of WORK inform me of a good teacher of cutting? Frock coats are my real difficulty."

Lead Weights.—W. W. W. (*Nottingham*) writes:—"Will some kind reader give me practical information as to the best way to mould lead weights such as a draughtsman uses, say ¾ in. long by 1¾ in. wide by 1¼ in. deep, having a mould on top and bottom, as per sketch? What metals, and in what proportion, should be added to the lead to have a hard and clean casting? Is it best to have a mould made in metal or in moulders, and to ensure a clear and perfect casting to prevent the use of the file? How to make the mould advised, if the weight is as per sketch?"



Lead Weight.

Haag's Water Motor.—B. J. (*King's Lynn*) writes:—"Can any reader of WORK give me a description of these motors?"

Measuring Up.—CEYLONESE (*Colombo*) writes:—"I would thank your readers for their views as to the best methods for me to measure up photographs and other perspective views of buildings, cylindrical figures, furniture, machinery, etc., each having one known dimension, and convert the same as far as practicable into working drawings."

Working Drawings.—CEYLONESE writes:—"I should be glad to learn, through 'Shop,' from whom I can obtain working drawings of bridges, cranes, furniture, etc."

Octagonal Moorish Stool. — ANGLO-DANE writes:—"Will some kind correspondent amongst the readers submit to the Editor a design for above, with colours, etc.? It is a very effective piece of furniture in a drawing-room, and quite within the scope of an amateur, I should say."

Launch.—E. G. (*Hereford*) writes:—"I have a flat-bottomed boat, built with pine and oak: it is 20 ft. long, 6 ft. wide, and 2 ft. 6 in. deep, and I wish to have it fitted up with steam engines and propellers—two ordinary slide-valve engines and two screw propellers. Would some kind reader let me know the size of engines and propellers? also whether two or three-blade propellers are best, as I wish the boat to travel as fast as possible, as I have some very rapid streams to pass over?"

Wood for Carving.—L. B. (*Hitchin*) asks for "the best shop in London to get lime-wood for carving on."

Candle Making.—G. N. (*Manchester*) writes:—"Could any reader tell me how to produce composite candles cheaply?—that is to say, could any reader describe to me through your columns which are the cheapest ingredients to use in composite candle making? I would, indeed, feel very thankful if you could do this for me, as I wish to try something in that line. I possess, of course, the proper moulds and wicks, only I should like to ascertain what best I could use so as to bring the article cheap and saleable."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Besom Makers.—J. W. W. (*Rensnaw*) writes to L. S. D. (see p. 625, No. 141) that Joseph Jervis, Whaley, Clown, Chesterfield, is a besom maker.

Mole Traps.—T. J. (*Preston*) writes to J. J. (*Cumberland*) (see p. 492, No. 135):—"Respecting wooden mole trap with steel springs. I can recommend Mr. Joseph Cross, Tangier Street, Whitehaven, for a good article in that line."

Flower-Pot Cases.—F. H. (*Battersea*) writes, in reply to INQUIRER (see p. 621, No. 143):—"I do not know any firm where expansible flower-pot cases can be had. Eighteen years ago I supplied most of the West-End houses with them; but since the fashion for jars and Doulton ware, there has been no call for them. If INQUIRER thinks there is a sale for them, I should be pleased to be in communication with him."

Wool-Winder.—R. T. T. (*Frome*) writes, in reply to MART (see p. 621, No. 143):—"These are not hard to make; appended design explains itself. The base is made of wood, with a recess turned in it for lead to give stability; the pin is ¼ in. iron or steel wire 9 in. long, 1 in. screwing into wood stand, turned up smooth, with a shoulder at the foot shrunk on, or a piece of ⅜ in. rod can be turned down to ¼ in., leaving the shoulder. The shell is a piece of ¼ in. brass tubing, 6 in. long, with a knob screw in at the top to give a finished appearance. This tube must have its bottom edge turned true, as it runs on the shoulder mentioned above. A and B are two brass collars, 1 in. diameter; A is fixed, while B slides up and down. and is fixed by a set screw, C, in any desired position; the nearer it is brought to A, the larger the skein that can be held. The laths are wood, ⅜ in. wide, ⅛ in. thick, and 7 in. long, riveted

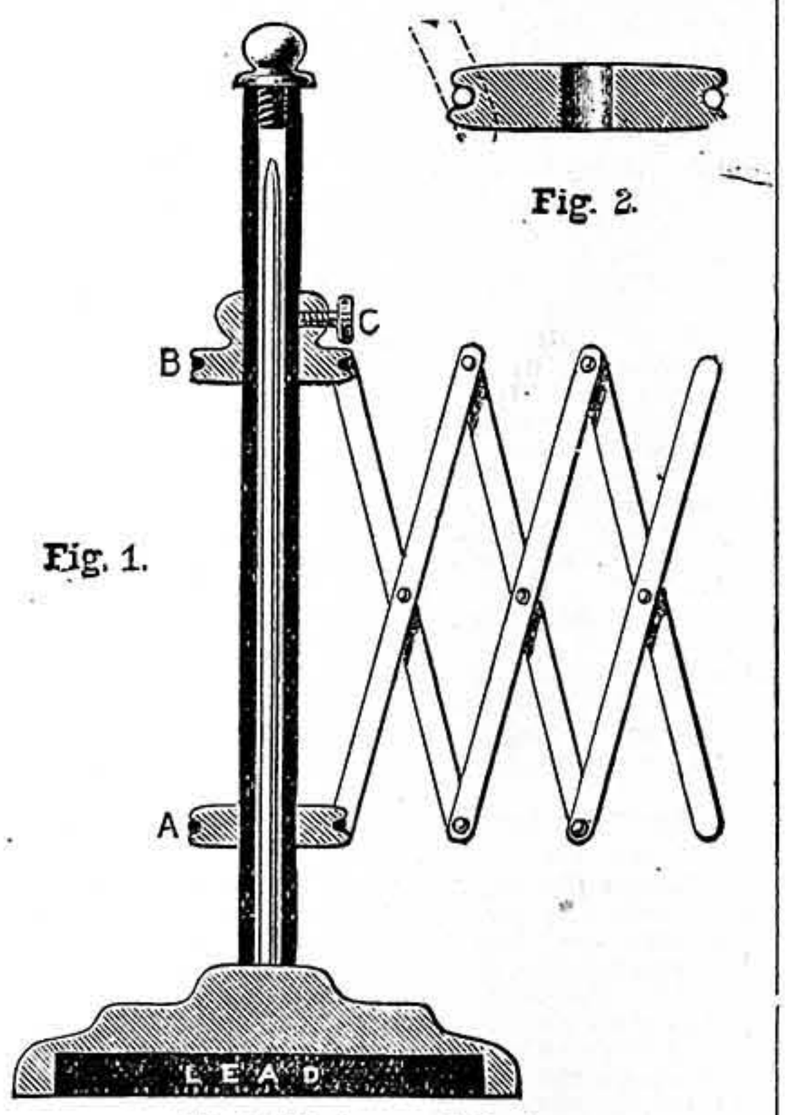


Fig. 1.

Fig. 2.

Wool-Winder and Parts.

to each other at the centres and ends. There are four sets, at right angles to each other, one only being shown in the sketch. The simplest way to fasten the laths to the collars is to turn a groove in the collar, as Fig. 2; cut four slots at right angles to each other, ⅛ in. wide by ¼ in. deep, into each of which one lath fits, as dotted line, Fig. 2, and a copper wire running in the groove, and passing through a hole in each lath, as shown, holds all tight, and yet allows the laths to turn as on a pivot. This size winder will hold any skein from 12 in. to 8 feet. As these make exceedingly popular Christmas presents to ladies, and can be easily made in numbers by anyone possessed of a lathe, I shall be pleased to write an article, giving detailed instructions and drawings, during next year, if the Editor wishes it."—[By all means submit this article on approval.—ED.]

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—W. R. S. (*Camberwell*); TELEPHONE; G. C. (*Woolwich*); A. S. M. (*Highgate*); F. S. (*Exeter*); W. T. C. (*Watford*); EBONY; RECTILINEAR; J. B. (*Lincoln*); BIMSHIRE; LOST MOTION; C. A. B. (*Swansea*); C. G. M. (*Penistone*); T. R. H. (*Birmingham*); C. F. B. (*Darlington*); N. S. S. (*Monkwearmouth*); MAC; NOVICE; F. W. R. (*Harling*); A SUBSCRIBER FROM THE FIRST; C. H. L. (*Falmouth*); H. W. (*Nunhead*); G. M. (*Swaffham*); J. S. (*Bedford Leigh*); H. Y. (*Poplar*); J. H. T. (*Dublin*); BOY SORTER; PERPETUUM MOBILE; W. J. H. (*Penzance*); J. S. (*Elswick*); H. R. K. (*Liverpool*); A. B. (*Leytonstone*); W. E. C. (*Wakefield*); F. S. (*Harrow Road*); H. H. (*Burton-on-Trent*); S. W. (*Ashton-under-Lyne*); C. H. O. (*East Dulwich*); F. S. (*Amsterdam*); WIRE WORKER; J. P. (*Menai Bridge*); J. M. (*New North Road*); W. T. K. (*Darwen*); J. A. (*Glasgow*); E. L. (*Woolwich*); W. J. G. (*Hastings*); J. H. (*Leeds*); J. H. L. (*Kensington*); R. K. (*Low Fell*); J. B. (*Carrick-on-Suir*); A. E. C. (*Tipton*); CONSTANT READER; ENGINEER; ONE WHO WANTS TO KNOW; CONSTANT READER (*Bradford*); AMATEUR MODELLER; CHICK; J. G. (*No Address*); J. MCJ. (*Cape Town, South Africa*).

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Planes.—Special Line. Trying, 5s. 6d.; Jack, 4s. 3d.; Smoothing, 3s. 6d. Bead and Rabbet Planes, 2s. All others equally low.—MARSHALL, Tool Merchant, 238, Old Kent Road, London, S.E. [17 R

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